SD421.3 , U56

FIRE CONTROL HANDBOOK REGION 6



PART I PREVENTION

CHAPTER I FIRE PREVENTION PLANS UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE NORTH PACIFIC REGION



POST OFFICE BUILDING
PORTLAND, OREGON

ADDRESS REPLY TO REGIONAL FORESTER AND REFER TO

FUPERVISION
Fire Control Handbook

November 1, 1943

and Range F

Mr. Harry T. Gisborne Northern Rocky Mt. Forest & Range Exp. Sta. Federal Building Missoula, Montana

Dear Harry:

Once in a while I think of you and wonder what you are doing. At least you know I think of you when you will remember that last January, in Spokane, I promised you a copy of our Regional Fire Control Handbook. The copy is enclosed. (under separate cover)

It has no cover - the war caught our cover order so we are improvising with any old manual cover until regular covers can be obtained. We did use a few old F.C.E.H. covers, but they became too narrow and besides we ran out.

Will you please (first find a cover) treat this as the station file copy. Amendments will be mailed accordingly.

I would be very glad to receive comments or suggestions for improvement. Rewriting Chapters 1 and 2, Part III, this winter - will combine and print. Other material as Fuel Type Mapping held up until after the war.

I am also enclosing instructions on Snagfalling and Horse Packing, which were recently issued as regional insert sheets to the F.C.E.H.

Harry, what's going on and what's new? How did the 1943 tests of the revised danger meter turn out? Glad to see the renewed emphasis on fire control research. We need to find out a lot about slash disposal, correlation of protection with intensive use of resources, what is adequate protection, damage, etc. Also if some of the Tree Farms say they should (and do) spend 15 to 18¢ per acre, what should be spent for protection on the National Forests?

Let's stir up something so we can meet at Spokane for a day or so this winter. Lots to talk about.

Very truly yours,

Assistant Regional Forester

Enclosures

RECORD OF RECEIPT AND INSERTION OF AMENIMENTS

R-6 FIRE CONTROL HANDBOOK

	10-0 1 351 00 00 00 110 11 1121	20120011	BUBECEAUS
Amendmen Number	t: Date of : Date of :: Amendme :Amendment: Insertion with:: Number	nt: Date of :	Date of Insertion with
number	: Signature ::	Americalent	Signature
51	: 4/28/49: 5/2/49 ENC::76	: 7/10/53 :	17/5300
52	:5/16/49:6/3/49 8/6/:775	7: 8/17/53:	8/27/53 00
53	: 6/1/49:6/15/49 ENC: 78c	>:7/28/53:	8/27/53 Do
54	: 6/27/49: 7/8/49 ENC 2:79	: 8/18/53:	8/27/53 00
55	: 7/15/49:8/8/49 ENC::80	: 11/9/53:	12/28/53 20
56	:8/12/49:8/19/49 ENC::81	: 2/25/54:	3/18/54 20
57	: 2/6/50: 2/16/50 EHC::82	:3/11/54:	4/19/5 a Do
58	: 6/14/50: 6/28/50 EHC 1:83	:6/3/54:	6/21/54 00
59	: 7/31/50: 8/11/50 EAC :: 84	: 6/11/54:	6/25/54 20
60	: 8/18/50 : 9/18/50 EHC:: 85		
61	: 9/21/50 : 10/10/50 EHC: 86		
62	:3/20/51 : 4/19/51 ENC::87		
63	:4/20/51: 6/15/51 EHC:288		
64	: 6/13/51 : 6/20/51 ENC 2:89	:	
65 not 1	40 1319 KI 24C\$::90		
66	: 7/25/51 : 8/9/5/ EHC::91		
67	: 4/3/52: 5/27/52 EHCx:92		
68	: 4/28/52:5/27/52 EHC::93		
69	: 5/28/52: 8/1/52 ENT:: 94	:	
70	: 6/24/52: 8/22/52 EHC195	:	
71	: 1/29/52 : 8/22/52 EMC: 36		
72	:12/17/52 : 1/14/53 ENC x:97		
73	: 2/25 /53 : ? ? ::98	: :	
74	: : ? ::99	:	
75	: 6/17/13: 7/29/33 00 ::100	:	attender de la constitution de l



REGION 6 FIRE CONTROL HANDBOOK PART I FIRE PREVENTION

Chapter I
FIRE PREVENTION PLANS

FIRE PREVENTION PLANS

Introduction

The percentage of man-caused fires in Region 6 is too high and must be reduced if fire suppression costs and losses are to be brought to an acceptable minimum. It is essential that all forest officers concentrate on the fire prevention problem in their respective localities. They should constantly strive to obtain the support of forest users so all will be careful with fire and observe the fire laws. This is essential if fires are to be prevented from starting.

Campers and smokers are responsible for by far the largest number of mancaused fires. The problem of reducing losses due to carelessness with burning matches and tobacco is a challenge to every forest officer.

In years past incendiarists have been responsible for heavy losses. Although use of the CCC and labor employment practices have fairly well removed the job incentive, there are still certain definite areas where incendiarism persists. Education, cooperation, and the development of a fire public consciousness will have their effect in reducing incendiarism, but vigilance is the most effective weapon to use against it. Continued effort toward the removal of the job incentive should be maintained where there is any indication that incendiarism is becoming prevalent.

Lumbering and other industrial fires are not numerous, but they burn a large acreage, cause a heavy damage, and are difficult to handle because they start in particularly hazardous areas. Debris burning also causes material losses every year. Fire losses in connection with these essential activities can be reduced by education and cooperation with land owners and operators, by contacts with them and use of special precautionary measures during critical periods, and by insistence on compliance with the law.

It is far better to prevent a fire by tactfully contacting operators or instructing campers in the proper manner of building and extinguishing their fires than by arresting them afterwards. Make friends and cooperators, not enemies, of the public.

Contacts with the public in law enforcement matters, such as issuance of camp-fire permits, keeping unauthorized persons out of closed areas, and similar measures, offer excellent chances for effective public relations work. Plans should provide for these valuable contacts.

The Fire Prevention Plan Outline

The purpose of the following outline is to <u>assist</u> forest officers in the preparation of their prevention plans. It will therefore serve primarily as a reference and a guide; the plan for each ranger district or other unit should fit local conditions as they exist.

- 1. Statement of objectives
- 2. Analysis of man-caused fires (by zones if desired)
 - (a) Occurrence zones
 - (b) Number of man-caused fires and percent by causes for occurrence period
 - (c) Acreage burned and percent by causes
 - (d) Relation of acreage burned and number of fires by causes
 - (e) Specific causes, reasons (why), class of people responsible, and source of people

3. Problems

- (a) Specific
- (b) General

4. Plans for remedial action

- (a) Contact plan
- (b) Educational plan
- (c) Closures and restrictions
- (d) Industrial operations
- (e) Reduction of physical man-created hazards
- (f) Sign posting

5. Supplemental action

Following is a discussion of the various headings in the outline, with sample forms and maps:

Objectives

In order to have a standard set-up for desired accomplishment in the execution of a plan, an objective is desirable. The objectives of individual fire prevention plans should be the reduction of numbers of mancaused fires in the zone, district, or other unit for which the plans are made to the lowest practical minimum at the least cost, and to reduce the danger of serious fires starting by reduction of the physical hazards. Each case is different, so each objective will involve the local problem or problems.

Analysis

Fire prevention action, to be most effective, should be based on sound analysis and planning, which should determine where fires start, causes of fires, classes of people responsible, where they come from, periods of time when fires start, factors leading up to the starting, and the reasons (why) fires start.

Where fire prevention plans are necessary, the minimum requirements in analysis are a fire occurrence zone map, and tabulations of:

Number of man-caused fires and percent by occurrence periods.

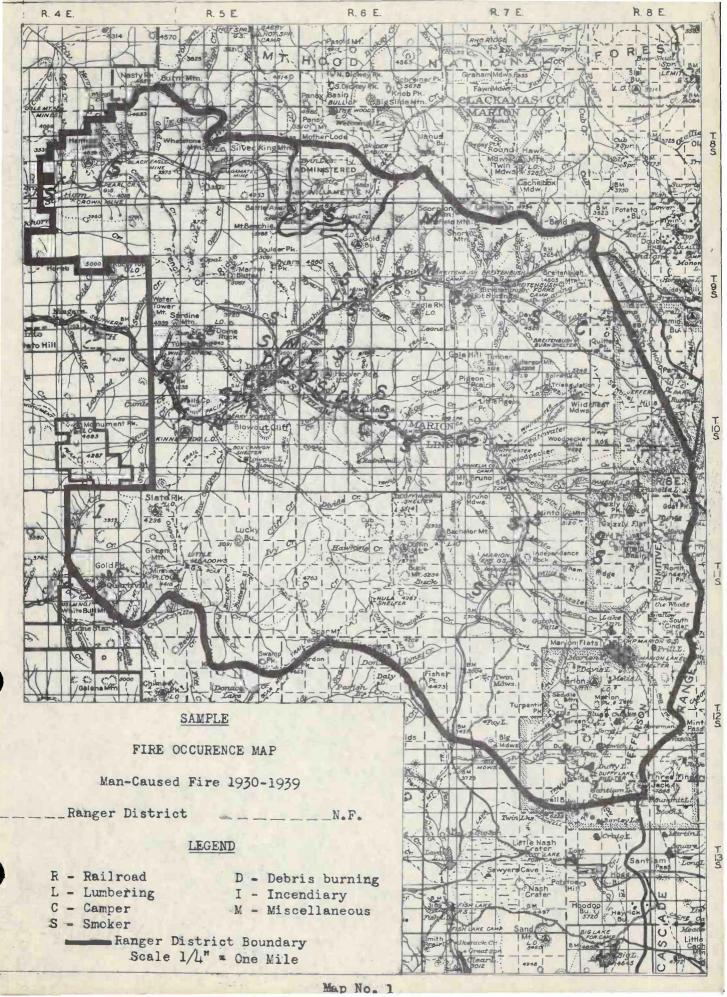
Acreage burned and percent by causes.

Relation of acreage burned to number of fires by causes.

Specific causes, reasons (why), classes of people responsible, and sources of people by classes, year, and number.

For basic analysis a ten-year period should be used, after which a current analysis should be made each year showing average at the end of each five or ten-year period. Additional charts and graphs may be made as necessary to focus peculiar problems or facts.

Following are samples of occurrence map, tabulation, and chart forms.



cause:	IT.	: با	·C	: 9 : D	: 1	. IVI	:R:	<u>ь:</u>	U:	0:	n:	1: 10	i:A:	口: (0: D	: וו	10	147	R	• 1	: 0	: 2	П	<u> </u>	: 14 :	Total
1930 1931	1	1	2 2	2		1			1										1	1	6	4 3	1		1	14
1932				3						2									1			9				10
1933		nati			1					2	1			1						1	1	4	1	2	ı	10
1934				1					1												1	1				2
1935			1																		1	4				5
1936				2					1	_			-						-		1	3				4
1937				2			Ŀ.	,	J.	1	7		1,						1	7	1	3	7			5
1938								Τ	7		Τ									1	. 2	Ţ	T			5
1939 Total	7	7	-	11	- 1	2		ז	<u></u>	5	2	-	7	7					2	2	18	34	3	2	2	66
1064.1	<u>+</u>	- ا	5	32		2			_	20	2			- -	3			-	1. 5	4.5		52		5 3	1. 1	5 100
	-		-) h					~	.0								-	40)	40,	21)~	4.	2)	4.) 100

Legend: R - F

R - Railroad

C - Campfire

D - Debris Burning

M - Misc

L - Lumbering

S - Smoker

I - Incendiary

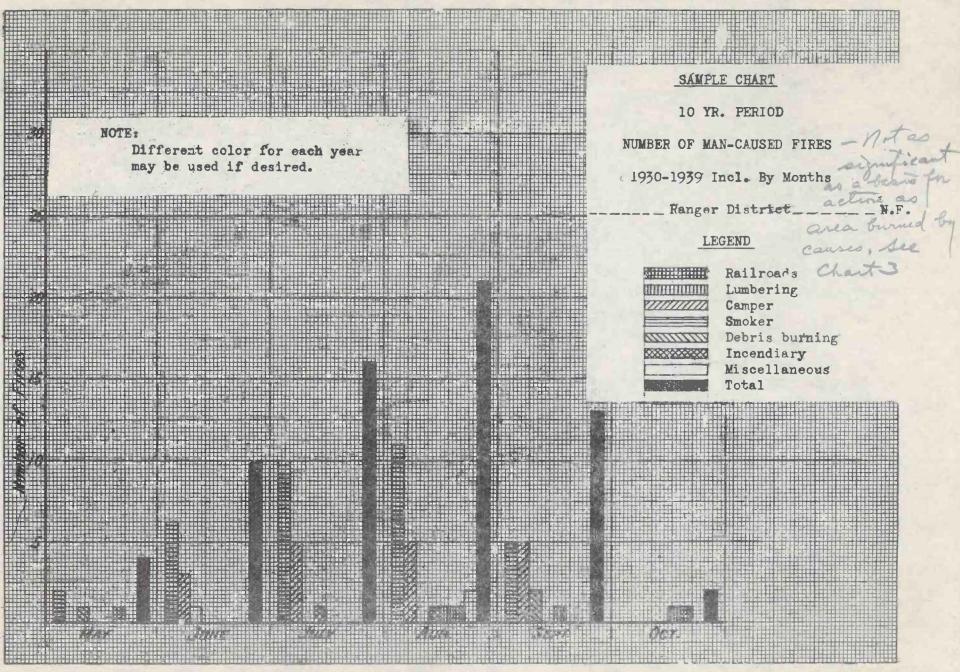
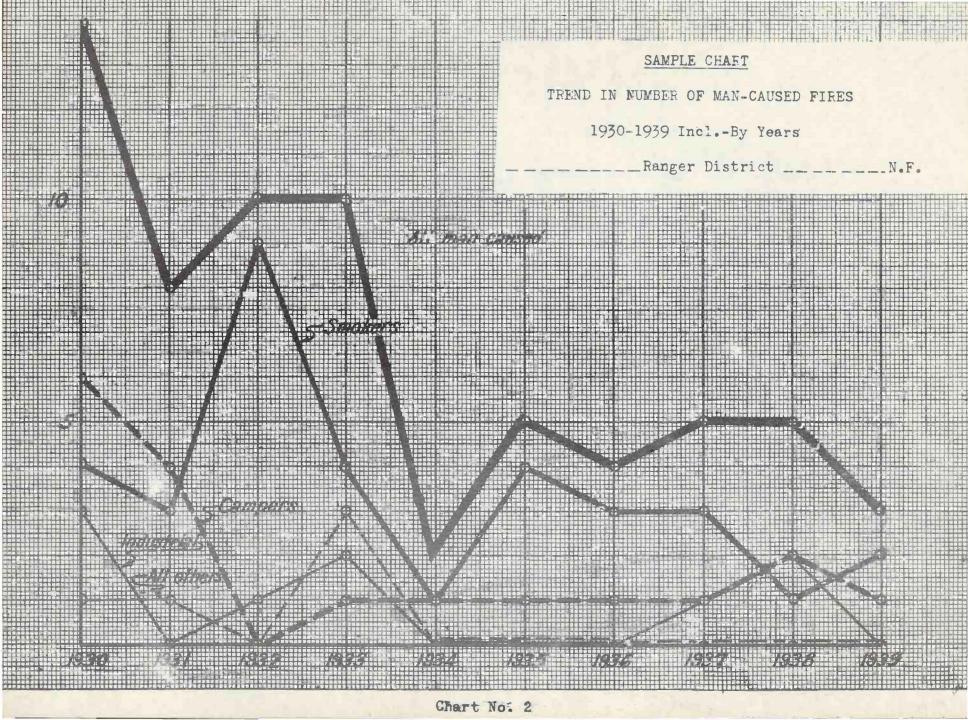
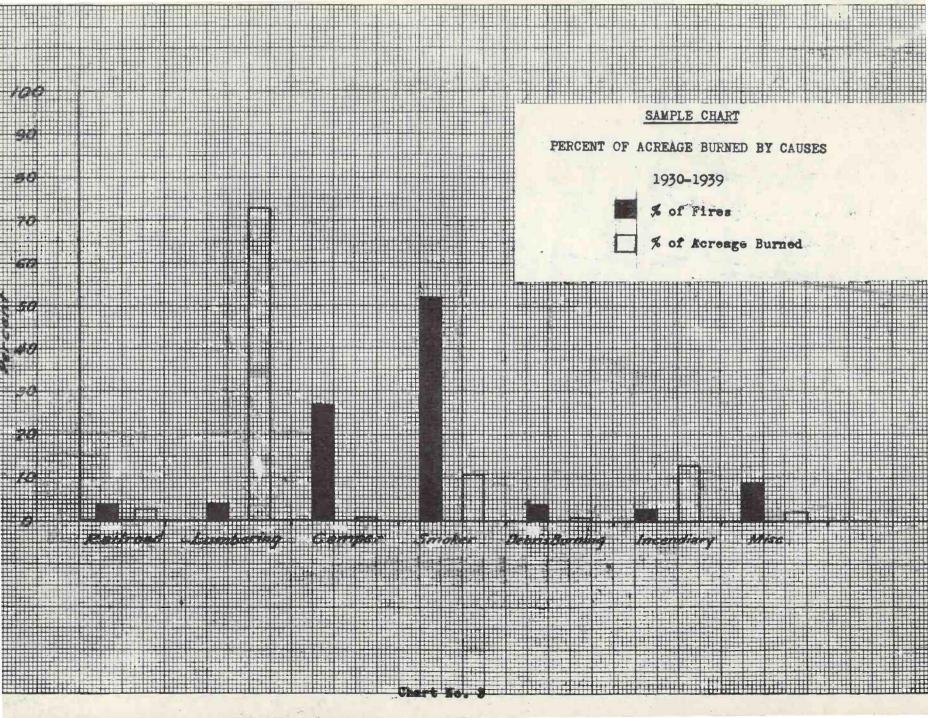


Chart No. 1





Sample Form, 10-Year Period

:	No. of	:	YLLANA	:			:	-		:	S	ource
			Specific Cause	:	Reason	(Why)	:	Class of	People	:		Outside
930												
950					and I							
931												
		-								-		
932												
	· · · · · · · · · · · · · · · · · · ·											
933												
										-		
934						No	ote					
22.5				115	Similar	analysi	s sh	eets to b	е			
935					made for			e other ed fires,				
00/					if in su	fficier		mbers to	7			
936					oe analy	zed."						
03 a												
937												
938												
770												
939						II real			XHI			
727												

Problems

A careful analysis of the tabulations and charts together with a knowledge of general conditions will be the basis for statement of problems, both specific and general. The number of problems involved is an indication of the completeness of the analysis.

Remedies or Possible Solutions

Each problem as indicated by the analysis will require some form of remedial action. In order to prepare job lists for this required action it is necessary to segregate the jobs according to classification and prepare plans of action.

The plans of action are included in six general classifications: personal contacts, educational activities, closures and restrictions, industrial operations, reduction of physical man-caused hazards, and sign posting.

1. Contact Plan: The contact plan will consist of a tabulation showing specifically, medium of contact, persons or classes of people to contact, who will do the work, when and where it will be done, objective in making contact, and method of approach or appeal. The method of approach should be given careful consideration, being sure that diplomacy is always used. Factors to consider in making the plan, such as economic benefits, sentimental interest in the outdoors and wild life, where fish and game are located, knowledge of individual or group interest in hobbies or activities, all furnish desirable means of making contact approaches. Many contacts, particularly those involving campers and industrial operations, will be taken care of in detail in ranger district strength of force plans.

Some methods of approach are: personal interviews, show-me trips, telephone communication, prepared talks, and illustrated talks.

Fire prevention talks by forest officers before schools, granges, service clubs, and similar groups are most effective. It is often possible and highly desirable and effective to furnish desired prevention material to members of speaker or toastmaster clubs or other qualified citizens and to obtain their cooperation in presenting talks. Appropriate illustrated slides or motion pictures often add interest to a group meeting. Any of these methods to be used should be included in the plan.

Reminder List for Contact Plan:

- (a) Contact key man or men in community who will assist in stimulating interest in community.
- (b) Meetings of cooperators, sponsored by the Forest Service.
- (c) Community gatherings.
- (d) Organizations.

- (e) Schools.
- (f) Stock meetings.
- (g) Cooperating agencies.
- (h) Individual contacts.
- (i) County, State, and Federal officials.
- (j) Contacts with guards or seasonal employees, soliciting their cooperation not only during fire season but yearlong.

Fire prevention contacts are a yearlong activity, and no opportunity should be lost to promote public and individual fire consciousness.

Certain portions of the contact plan may be set up as a separate part of the fire prevention plan and placed in the files for the personal use of the District Ranger or Forest Supervisor if considered desirable.

Following is a sample contact plan.

SAMPLE CONTACT PLAN

Name	: Occupation	: Responsibility: for Contacts	: Objective :	Method of Approach
Robert Evans	: Rancher	: Supervisor : Staff man	: policies are worthy of :	Social interviews, taking advantage of opportunities to dis-
	:	: District Ranger :	<pre>: majority of thinking : : people. :</pre>	cuss the merits of burning vs. absolute protection.
Union County Chamber of Commerce	: Business man : and local : community : boosters	: Supervisor : Staff men :	: To inspire thinking about : fire prevention and enlist: their cooperation in being: careful themselves and in : influencing others.	Club, particularly the Secretary. Arrange for
James Reed	: State Highway : Maintenance : Foreman :	: District Ranger : : :	: Secure his cooperation in : checking camping spots and: urging care with fire as : opportunity offers. Also : watching for fires along : highway.	Show interest in his problems and discuss fire prevention prob-
John Hendricks	: Stockman : :	: District Ranger : : : :	<pre>: started by packers and : herders. :</pre>	Personal interviews. Show appreciation of his labor problems. Bring out danger to his interests from fire. Insist on care by his employees.

(Note - Not necessary to duplicate contacts provided for in PR plan).

2. Educational Plan: The educational plan is to promote general public fire consciousness and interest in fire prevention measures. Based on the stated general problems, this plan should include the best procedure for the solution of these problems. The educational plan will consist of a tabulation showing: subject of material, whom to reach, responsibility (who, when, and where), objective, and method of approach or appeal.

In the preparation of the educational plan due consideration must be given to the reason man-caused fires are started before the solution of the problem can be properly made.

The reasons for man-caused fires may be divided into three classifications:

- (1) Ignorance on the part of those who have been uninformed or misinformed as to fire prevention measures. Many of these people, although their actions are well meant, are not conscious of the danger of fire in the forests. This includes the class who will build a campfire beside a dead stump or log, or believe that by pouring water on the top of a campfire it is extinguished; and the brush burner who does not recognize bad fire weather and will set fire to a number of brush piles in dangerous fire weather, thereby endangering surrounding public and privately—owned property.
- (2) Carelessness on the part of those who have been ill-trained or have little regard for the results of their action. This includes the cigarette smoker who has the habit of throwing away lighted cigarettes or lighted matches, the sawmill operator or logger who does not take proper fire preventive measures on account of the necessary expenditures, and the camper who leaves a campfire unattended, or leaves it unextinguished.
- (3) Maliciousness. Those responsible for this class of fires are the lawless element having no regard for personal injuries or destruction of resources and property. This includes those who will set fires to satisfy a personal grudge or for self-benefits.

Methods of Solution: General education and strong favorable public sentiment will eliminate a number of these problems. If the uninformed as to fire danger are educated, if the careless secure additional education through publicity or the process of law enforcement (which is backed by public sentiment), if the malicious and selfish ones find that they are contending not only with officials responsible for fire control work but also with the vast majority of their neighbors and the people in general who are backing this activity, the objective will be accomplished.

Reminder List for Educational Plan:

- (a) Build respect and liking for the local forest officers and organization.
- (b) Build favorable individual and public opinion toward Forest Service objectives and work accomplished, including information on fire danger rating and special plans for fire control management.
- (c) Use of organized community cooperators in fire prevention work.

 An effective medium in many communities.
- (d) Cooperator handbooks.
- (e) Key man mailing lists.
- (f) Local press publicity.
- (g) Contributions to radio stations.
- (h) Contributions to local Red Cross chapter.
- (i) Circular letters.
- (j) Distribution of literature.
- (k) Exhibits.
- (1) Showboat programs.
- (m) Auto identification tags.
- (n) Ash tray stickers.

The press is a valuable medium of reaching large numbers of people. Detailed technique in this field is discussed in the R-6 booklet "Forest News Reporting" (which every forest officer should have) and in Division of Education and Information handbooks or other written material. Fire prevention articles, editorials, and fillers can be arranged with the local press for the spring and summer months. In this material the old "scarehead" type of appeal should be avoided. The aim should be to bring out constructively the economic, social, and rehabilitation aspects and benefits of the forests as the reason for preventing forest fires. During the fire season plans should provide for giving current news of going fires to the press. If editors and reporters are not given the facts, they will obtain news, probably distorted, from other sources. In such news items, it is desirable to play up damage done and causes rather than number of men employed and amount spent. Prompt and adequate publicity should be given to law enforcement cases while they are fresh.

Following is a sample plan of fire prevention educational activities:

Sample Plan

FIRE PREVENTION EDUCATIONAL ACTIVITIES IN CONNECTION WITH PUBLIC RELATIONS PLANS

	: WHOM TO	: I	RESPONSIBILITY		:	:METHOD OF APPROACH
SUBJECT	: REACH	: WHO	: WHEN :	WHERE	: OBJECTIVE	OR APPEAL
All-Service	: :General Publi	: c: Supervisor	: Regularly, :	Prepared mail	: -: Keep public informe	: d:Mail direct or con-
and Regional Press Releases	•		: as received:		of fire prevention	tact with reporters -: or editors, adding :local color where- :ever possible. :
Local Press	: Local People	: Supervisor	: Daily :	Same as	:Keep public informe	d:Contact with re-
Material	•	: Staff man			of fire prevention	:porters or editors.
	•	: District	: etc. :			-: Mail local contri-
	:	: Ranger	•		:phasizing elimina-	
	:	•	:		:tion and reduction	
	•	:	*		of man-caused fires	
			:Once a week :		:Same as above.	:Talks by forest
and contribu-		: Staff man	:throughout :		:	officers, and by
tions to radio	•	: **Ranger	:fire season;:		:	:cooperators. News
stations.		•	:intermittent:		:	items prepared by
		?	:ly through- :		•	:forest and read by
		:	out year. :		:	:radio station an-
		*	: :			:nouncer.

Similar information should be tabulated for talks, literature, circular letters, exhibits, window displays etc.

^{*}Note - not necessary to duplicate activities provided for in PR plan.

^{**}Manuscript or material to be approved in advance by forest supervisor.

ensidued in deciding "need" # fines already furning, Fire Davign (ating, rangers

3. Closures and Restrictions: The closure laws and restrictive regulations are a most important and effective means of preventing fires. They apply to fire prevention measures only and should not be used for any other purpose. To be effective, they must be based on the need for the action, be established in accordance with Federal regulations or State laws, and be enforced.

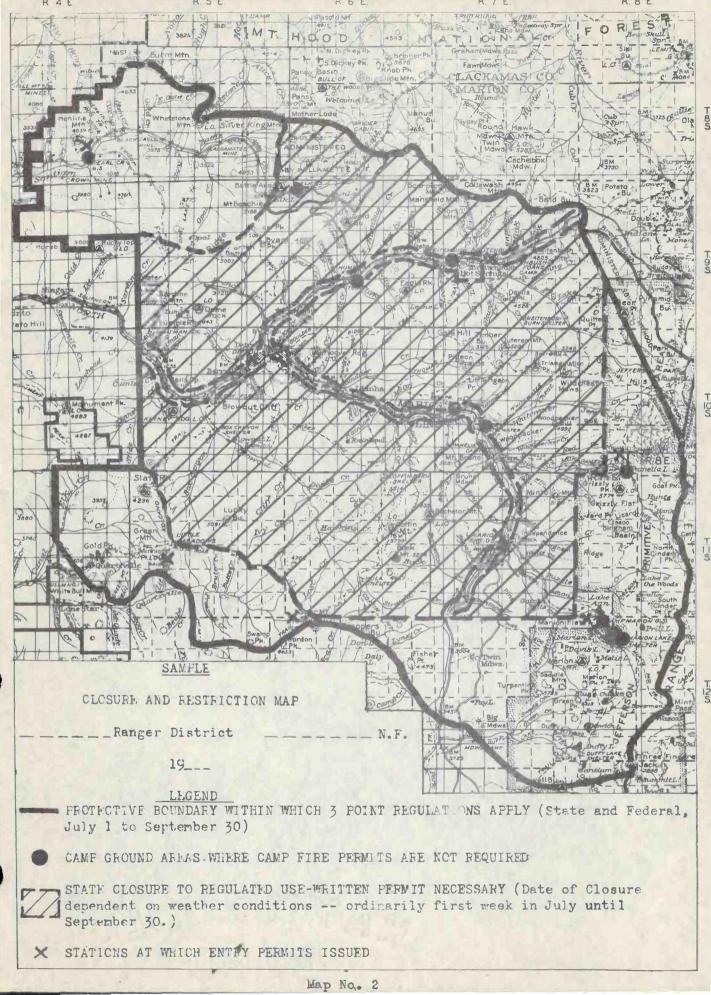
The closure plan should consist of a map showing areas and stations at which entry permits will be issued, and a plan for use of registrars, for posting areas, and for informing the public of such closures.

On account of the attitude of some of the general public to disregard safety measures in the use of fire, a number of fire restrictions have become necessary. The public should be informed of restrictions by news items in local papers from time to time throughout the fire season, particularly immediately prior to the dates they become effective. In calling the attention of the public to the restrictions, the fact that campfire permits and fire-fighting tools are not required at designated campgrounds and that smoking while stopped at a safe place is permitted, should be emphasized. The why is always important. The public should be notified as to the locations of designated campgrounds and where campfire permits can be obtained for camping elsewhere.

The fire prevention plan should designate the selected cooperators for issuing campfire permits or rendering assistance in law enforcement; include a map showing status of restrictions; specify definite arrangement between adjoining ranger districts or forests; and indicate means of publicity to inform the public when restrictions become effective, where permits can be obtained, and exceptions to requirements.

The Manual, Volume III, and State laws should be referred to for complete details on closures and restrictive measures.

Following is a sample closure and restriction map:

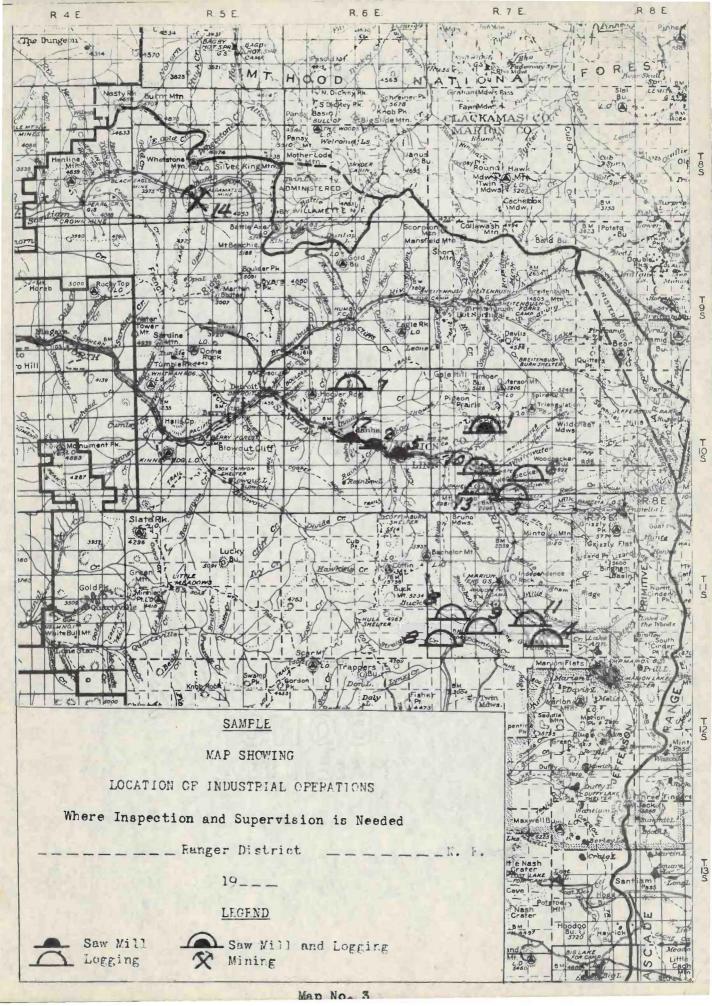


4. <u>Industrial Operations</u>: Inspection of industrial operations is an important phase of fire prevention. Records indicate that fires from industrial operations contribute a large percent of burned acreage and fire suppression costs because they start in particularly hazardous areas and are difficult to handle.

In the preparation of this plan due consideration should be given to frequency of inspection, which should vary with fire weather conditions. Too frequently such inspections are made by guards inexperienced and not qualified, resulting in inadequate action and subsequent fires. The objective of this plan is to secure compliance with State laws or agreements by industrial operators.

The plan for inspection of industrial operations should consist of a map showing the location of industrial operations where inspection and supervision are needed; a tabulation showing map designation, kind of hazard, operator responsible, ownership of land, extent of operation, inspections to be made and by whom and when, and what to check.

Following is a sample map and form for inspection and supervision of industrial operations.



Sample FOR INSPECTION AND SUPERVISION OF INDUSTRIAL OPERATIONS

Kind of:Map:	_	: Owner ship		: Inspections to be Made :	
Hazard :No.:	Responsible :	of Land	or Acres	: When and Whom :	Items to be Checked 1/
	eitzinger Lumber: ompany			:Spring, mid-season, and :fall by district ranger, :or more often if necessary: :to obtain compliance. :Guard to inspect bi-weekly: :July, August, September, :except daily when B.I. :class 4.	cable State laws.
Planing: 2: 0	Jones Lumber Company	R. S. Smith	: 1 Mill	: Spring, mid-season, and :fall by district ranger. :Guard to inspect bi-weekly: July, August, September.	burning, water system,
Logging: 3	Lloyd E. Hadley	O. D. James	:80 Acres	:Spring, mid-season, and :fall by district ranger, :or more often if necessary: :to obtain compliance. :Guard to inspect bi-weekly: :while on duty except daily: :when B.I. is class 3 and :twice daily when B.I. :class 4.	of Oregon operating per mit and with State law.

Etc. for each operation.

^{1/} Operation permit refers to western Oregon only. Items to check will vary with each operation, and a check list for use by the district ranger and guard may be advisable so the various items will not be overlooked.

- 5. Reduction of Physical Man-Created Hazards: A plan for the reduction of physical man-created hazards should be prepared which will ordinarily consist of a cumulative map record showing the extent of hazard and where located and a tabulation (Form 90-R6) showing current status of hazards requiring remedial action and not included in the Project Work Budget.
- * Cumulative Map Record and Tabulation: For complete instructions on preparation, refer to T.M. Hdbk., R-6 Part IV, Chapter C. *

The recording of this information on the form will necessarily require previous field inspections and contacts. The method of disposal cannot be determined until the area has been inspected, neither can it be definitely stated by whom the work and supervision will be done, until the responsible parties have been contacted.

In many cases detailed plans for disposal of private slash may require assistance by a forest officer. This tabulation, to be kept current, will show the status of physical man-created hazards included in the cumulative map record. The map and tabulation (Form 90-R6) should be included as part of the Historical Record required by Timber Management.

6. Sign Posting Plan: The preparation and execution of this plan are an important part of the fire prevention job.

The location and posting of fire signs are an effective means of informing the public concerning regulations, restrictions, and care of fire within the forest or protective area. In the preparation of this plan, consideration must be given to the occurrence map and classes of fires. For example, if smoker and camper fires constitute the bulk of the man-caused fires in a given locality, then every effort should be made toward the proper posting of signs related to these causes. Likewise special prevention posters should be posted at selected locations where they will secure the greatest results.

The plan should be prepared in accordance with instructions in the Sign Handbook.

The information required is a 1/2" scale map indicating the location of the posters and a tabulation showing map or location number, name of place where posted, road or trail distance if logged, location of poster on ground, poster number, date placed, and initials of person placing the poster.

Map: In order that a copy of the map may be used for information in posting, the indicated place for posting should be shown as exactly as possible. For isolated posters, the center of the circle will indicate the location. Where posters are so close together that they can not be so indicated, the symbols should be placed to one side with a fine line drawn from the symbol to the point on the map where the poster board is located.

Tabulations: A sample form is shown on page 20.

Supplemental Action: Since the fire prevention plan is made for a period of one year, problems may arise during the season which are not included in the plan, but which require action. A settlement of immigrants from a nonforested area may develop a problem of education in fire prevention, or a series of mancaused fires during the season may require a current analysis to determine the cause and what additional remedial action is necessary. Officers responsible for the preparation or execution of a plan should be ever alert to new problems or improvement of the plan.

In order to avert the necessity of revising the plan in midseason, a supplemental action part should be added for the purpose of listing such additional problems and actions as may be required.

SAMPLE FIRE PREVENTION FIRE POSTER TABULATION FORM

				and the same of	and the second second				Name and Address of the Owner, or the Owner,					
:	Мар	:		:	Logged	:			: Poster		Date	:	By: (Initials	2
	No.		Where Posted	:	Distance	:	Ground Lo	cation	: No.	•	Posted		(Initials):
	100			•	3200000		02.000	300000000000000000000000000000000000000			20000			•
								* * *						
•		•		•		-	¥.		•					
•		•		•		ga			•			•		•
:		:		:		*			:	:				:
:						96			9	:		:		:
:				4	7				2	3				:
:		4		, A2				Y	e.	:		:		
*		*		:					•	4		2		:
*		3		8					:	*				
		44				7.				(
												9.		
9				•		***			A	•			14	*
:		9				. 4			•	:				:
of a		*		*		R			:	•		:		2
•		0		*		A			•	•		:		*
, a		2		:		9			•	:		:		:
		:						3	•	:		:		5
		:		:		:			*	:		- :		
٠								2	•					۰
						-			*					
i e		•												:
•		•		•		•			•	•		a a		•
5		ů.		•		3			•	>		15		4
:		3		å		:			:	b.		No.		39
•		2		:		, de				:		5		:
10		:		2		*			•	ı		4		:
		•		:					•	:				:
		*							Ł					
		.5		٠								40		
		-				56			•	H		•		
•		•						-	•				-	- 3

FIRE CONTROL HANDBOOK REGION 6



PART I PREVENTION

CHAPTER 2
HAZARD REDUCTION

REGION 6

FIRE CONTROL HANDBOOK

PART I

FIRE PREVENTION

Chapter 2

HAZARD REDUCTION

PART I - FIRE PREVENTION - Chapter 2

HAZARD REDUCTION

Table of Contents

	Page No.
Introduction	I-2-1
Ranger District Coop Slash Treatment Org. & Financial Plan	I-2-1
Slash Disposal Appraisal	I-2-2
Slash Treatment Plans Selectively Cut Areas. Ponderosa Pine. Light Selection. Heavy Selection. Sample Map Douglas fir Amount and Method of Cut Size of Areas. Degree of Cleanup. Sample Map Clear Cut Areas. Advance Planning.	I-2-4 I-2-4 I-2-4 I-2-7 I-2-7 I-2-7 I-2-8 I-2-8 I-2-8 I-2-8 I-2-10 I-2-10 I-2-11
Advance Preparation	I-2-14 I-2-15
Supplemental Additional Protection Piling and Burning Piling Slash and Debris Hand Piling. Rick Piling. Tractor Piling. Cable Piling. Burning Slash and Debris. Swamper Burning. Lop and Scatter. Chipping Broadcast Burning. Choosing the Slash Moisture Conditions for Burning. Setting the Fires Holding Slash Fires Under Control Mop-up and Patrol	I-2-16 I-2-16d I-2-16d I-2-16e I-2-16e I-2-16g I-2-16f I-2-16i I-2-16i I-2-16i I-2-16i I-2-16i I-2-16i I-2-16i I-2-16i I-2-16i
Snagfalling (Surveys and Plans)	I-2-17
Introduction to Planning Snagfalling Projects	I-2-17 I-2-17 I-2-27 I-2-28

R-6 F.C. Hdbk.
Page Amended 7-28-53
No. 77

Table of Contents (Cont; d.)

		Page No.
	Firebreaks and Lines (Surveys and Plans)	I-2-30
	Introduction Objective and Priorities Douglas-Fir or West Side Burns after Snagfalling Douglas-Fir Selectively Cut Areas or Old Clear Cut Areas Slash Not Burned Ponderosa Pine with Slash Partially Treated. Blow Down Areas or Lodgepole Bettle Killed Deadenings The Project Plan for Firebreaks and Lines.	I-2-30 I-2-30 I-2-30 I-2-32 I-2-32 I-2-33 I-2-33
	Recreational Area Cleanup (Surveys and Plans)	I-2-35
	Introduction	I-2-35 I-2-35 I-2-35 I-2-39
	Power-Line Cleanup (Surveys and Plans). ,	I-2-41
	Introduction	I-2-41 I-2-41
	Highway or Railroad Fire Lines (Surveys and Plans)	I-2-42
	Introduction	I-2-42 I-2-42
	Roadside Cleanup (Surveys and Plans)	I-2-44
	Introduction	I-2-44 I-2-44 I-2-45 I-2-46 I-2-47 I-2-47 I-2-48 I-2-48 I-2-48
	Guard and Administrative Station Cleanup (Surveys and Plans)	I-2-52
	Cleanup Standards for Use in Making Project Plans Project Cleanup Plan	I-2-52 I-2-52
	Sample Cooperative Agreement for *-Additional-* Protection Including Slash Disposal on Private Lands	I-2-54
	Stipulations for Clearing Projects	I-2-57
	Bibliography	I-2-66
۴.	A Guide to Hazard Reduction & Fire Prevention Measures for Power Lines	I-2-67-**
	R-6 F.C. Hdbk. *Amended **Added 7-28-53 No. 77 (ii)	

HAZARD REDUCTION

Introduction

A substantial increase in the acreage of high hazard fuels has taken place in the region in recent years. This condition is due largely to increased industrial activities in the forests and to the results of natural factors, such as fire, windthrow, insects, tree diseases, moss, and accumulation of undergrowth and debris. Higher actual and potential values and damage, together with heavy man-caused fire risks, make it essential to the proper management of the forests that these hazards be promptly reduced to an acceptable standard or given intensive protection. The objective is to provide adequate protection or to reduce the hazard to the minimum consistent with the silvicultural demands or contemplated use of the area and yet kept within reasonable physical and financial limitations.

Slash treatment is an integral part of the timber-harvesting job with possibilities to secure beneficial or disastrous results depending upon the degree to which known fire-control principles and slash-disposal methods are employed. Proper slash treatment can be an aid to reduce the fire hazard, improve conditions for natural reforestation by making it possible for seed to reach bare soil, reduce the cost of planting by making it easier for planters to get around, and protect the thin soil on steep slopes by lopping and scattering the slash. Improper slash treatment can nullify the beneficial results enumerated above, jeopardize the residual and adjacent commercial timber stands and risk the expenditure of large sums to fight difficult slash fires.

The policies and objectives for slash treatment are contained in 6 FSM 403.3 and 403.4 including R-6 supplements and 7 FSM 102.14 and 102.15.

The slash-treatment job consists of (1) preparation of a ranger district slash-treatment organization and financial plan, (2) preparation of a slash-disposal appraisal, (3) preparation of detailed slash-treatment plans, and (4) application of the proper slash-treatment method.

Ranger District Coop. Slash-Treatment Organization and Financial Plan

The purpose of such a plan is to provide a procedure for (1) summarizing all planned Brush Disposal income and expenditures on a ranger district, (2) distributing the income by years based on planned needs, (3) securing an annual check between planned income and planned expenditures, and (4) listing planned Brush Disposal organization. The need for such a plan is particularly important where additional subsequent protection is planned to insure that funds will be available to meet planned obligations should there be a reduction in the anticipated annual cut.

The plan consists of an atlas-size sheet and a ranger district $\frac{1}{2}$ -inch map. The atlas-size sheet is divided into two parts. The upper half lists the estimated Brush Disposal income and the lower half lists estimated expenditures with headings as shown on the following page. All entries are in pencil and adjusted annually prior to the field season.

The mechanics of preparing the plan are as follows:

- l. List sales as they are made and the planned Brush Disposal income.
 - 2. Fill out the estimated cost of planned needs by:
 - a. Determining annual slash treatment job,
- b. Listing the organization required (detection, patrolmen, slash disposal or in lieu protection crews. etc.) to treat slash. and
- c. Listing the amount of money that will be required to accomplish the planned needs each year.

Example: For a specific large sale or drainage, you may have need for an emergency lookout for six years, a patrolman with radio-equipped vehicle and slip-on tanker for five years, and a slash disposal crew of ten men for one year. Therefore, the first year's cost would be the total of the crew plus salary of patrolman, cost of vehicle, radio and slip-on tanker plus cost of emergency lookout. The second year would show only cost of patrolman, lookout, etc.

- 3. Distribute income by years based on planned needs.
- 4. Clear with administrative assistant as necessary to make sure you have enough "earned income" to finance planned work.

The one-half inch map will be titled "Slash Area Index Map." The boundaries of each slash area will be roughly indicated on this map and given a number. The same number will be shown on the plan in the column provided. The map and plan will be placed in the Fire Control Atlas facing each other with the map on the left.

Slash Disposal Appraisal

The treatment of slash is a logging cost allowable in the timber-sale appraisal. An estimate of this cost should be based on an extensive survey of work to be done. The best time to make this survey is when establishing the boundaries of the cutting units. Items to be considered in the survey are listed on Form 121-R6, a copy of which is shown on page I-2-5. Most of the items on Form 121-R6 are self-explanatory, but a few require amplification as follows:

Item A-5: Enough should be said to enable those interested to obtain a good idea of the factors influencing selection of the method and the cost of treating the slash. It is particularly important to explain conditions resulting in abnormal costs.

Item C-la: This pertains to slash that was originally on the right-of-way and pushed off to the side prior to grading. The cost of burning right-of-way slash is usually included in road construction cost and done by the operator. The cost of such burning should not be included here unless road construction slash and logging slash are so badly mixed they cannot be burned separately in which case the cost will be shown here and excluded from road construction costs.

Item C-3: Includes all costs where treatment is by burning including cost of preparing plans, signing area, laying out hose, construction of water holes or sumps, purchase of or rental of equipment, actual burning, mop-up patrol after burning, reconditioning and storage of equipment after job is completed.

Ranger District

Coop. Slash-Treatment Organization and Financial Plan

PLANNED INCOME

Index		· Het	. Total:	71171717	1110 0311							
THUE	. Colo	יבם י	· IOOGI:	D4 -4				ma ha	- h	~ ~ ~ ~	222	maada
Map Map	: Sale :Designation	• D D	anned :	חבבים	DE 2 - 3 (TOU O	LINCO	ome ba	Sea o	TO TO	Timed	11eeus
NO.	Designation	:B.D.	Tucome:	1952:1	L953:1	954:15	155:15	20:17	51:19	20:19	27817	00:1901
	•	:	:	:	:	:		•	8	:	:	:
	•	:	:	:	:	:	0	:		:	:	5
	:	:		:	:		•	:	8	:	:	
	:	:	:	:	:	:	:		:	:	:	9
	:	:	:	:	:	:			:	:	:	0
	:	:	:	:	:		•		:	:		:
	:	:	:	:	:	:	•	:	:	:	:	:
	•	:	:	:	:		:		:	:	,	
	:	:	:	:	:				:	:	:	:
	:	:	:	:	:		:			2		:
	•	:	:	:	:	:	:	ĕ	:	:	:	
	:	:	:	:	:		:		:		:	:
	:	:	:	:				:		:	:	:
	:	:	:	:				*	:		:	:
	•	•			•	•		•				•
	: Work Area	: :Orga:	nization:	: 1952: I	: 1953:1	: 954:19	: 955:19	: 956:19	: 57:19	: 958:19	: 959:19	: 60:1961
	: Work Area	orga.	mzacion:	19528.	L953:1	754: 13	755:15	(20:T)	(5 (: 1)	(20: T)	(5) 15	00:TA0T
	• ar ge parep	•	•			•	•		•			
	•		•	:		Ď	•	•	•		•	
	•		•			•	•	•	•	۰	۰	•
		•	•			•	•		•	ě	ō	ō
	:Drainage			•	•	•		5	•			ŏ
		•	:	:	5,		:	ŏ	:	•	•	
	:Areas	•	•	•	:	:	:	•	:	:	•	:
	1	:	:	:	:	:	:	:	:	:		:
	•	:	:	:	:	•	:	•	:			:
		:	:	:		:	:	:	ů			:
	:District	:	:	:	:	:	:	0	:		:	:
	•	:		:		:	:	8			:	
	:	:	:	•		:	b D	0		0	:	0
,	:	:		# #	:	:	:			:		
	:	:	:	*	:	:		:	:			0
1	:Totals	Ê	:	*	:	*	9	* '	:	0	:	6
	:	:		*	:	0				0	0	

Item C-4: Includes the cost of felling snags that constitute a hazard in the control of the slash fire. Particular attention should be given to the felling of dangerous spark-throwing snags in the slash area and those in the green timber adjacent to the exterior edge of the slash area. Felling of unmerchantable green trees in the slash area or trees killed by the slash fire is not a proper charge to slash disposal and should not be included under this item.

Item C-5: Include here only cost items in connection with the providing of additional protection in lieu of slash burning. Preparation of a detailed map (hazardous area map) showing water developments such as pump holes, tank-filling stations, etc. and the signing of these developments for slash areas provided additional protection in lieu of actual disposal will be included here. The hire of lookouts and patrolmen to prevent, detect and suppress fires in the slash area, after the operation is completed, will be shown under Item C-5b, and equipment for these men, such as radios, tankers and purchase of pickups or payment of pickup rental as necessary to enable them to efficiently do their job will be included under Item C-5c. There is little chance of an operator ever accepting the responsibility of providing additional protection in lieu of actual slash disposal, and, therefore, this column has been crossed out on Form 121-R6. The cost of protection connected with the logging operation should not be included on Form 121-R6.

Slash Treatment Plans

Selectively-Cut Areas

Logging methods and cutting practices affect amount of fuel in selectively-cut areas. Reducing logging damage not only saves the residual stand, but it creates less fuel. The amount of fuel can be reduced by doing such of the following as are applicable:

- 1. Use care in the location and clearing of tractor-skidding roads.
- 2. Avoid marking scattered or individual trees in thickets of young trees.
- 3. Fall trees generally toward or nearly parallel to tractor-skidding roads, so logs can be skidded without siwashing reproduction, poles, or trees.
 - 4. Fall and skid in stages.
 - 5. Mark tractor routes from the tractor road to the logs.
 - 6. Use drums to pull logs straight out into openings.
- 7. Buck windfalls in advance of skidding or construction of tractor-skidding roads.

Ponderosa Pine. Slash-disposal methods in selectively-cut ponderosa pine areas vary with the cutting practices, ownership of the land, and management objectives.

HAZARD REDUCTION Slash Disposal Appraisal

(Considerable applicable items only—Refer to NF-A, R-6 403.4; and Part I, Chapter 2 and Part II, Chapter 4, R-6 F.C.H.)

(Forest)	(Ranger District)			(Sale Unit or Area)	
General Information					
1. Major timber type to be cut	2. Total net volume to	oe cut	МВМ		
3. Gross volume to be cut per acre:					
4. Total acreage to be cut:	clear cut:		selectively	cut	
5. Describe special conditions about timber	stand or planned disposa	l or protect	ion methods—Us	e reverse side if necessar	
		**	••••••		
Protection Information (See Section 3, C	Chapter 4, Part II, F.C.H	[.)			
1. Does area have satisfactory direct visib	ilitý from lookout(s)?		,		
2. Will temporary lookout coverage be nec	essary?	***************************************	***************************************		
3. Will regular firegoer coverage be satisfa-					
(Describe planned intensive protection in			<u>-</u>		
Financial Appraisal (Include total cost in	EF.		F.C.H. for standa	rds.	
		1	COS		
48 ·	Units in	Per	Total.		
	Area	Unit	F. S. Coop	Operator	
Slash Piling or Bunching:		-		XXXXXXXXXXX	
a. Roadside construction slash				XXXXXXXXXXX	
b. Logging slash along roads		UWI I			
c. Other strips or areas					
Fire Lines (to mineral soil)					
Burning Slash (piled—bunched—swampe	-r				
clear-cut areas—concentrations)					
Snagfalling:					
a. Roadside, special strips and areas					
Extra Protection:				XXXXXXXXXXXX	
a. Mapping and signing				XXXXXXXXXXX	
b. Add. subseq. det., patrol, firemen				XXXXXXXXXXX	
c. Special equipment (Describe)				XXXXXXXXXXXX	
Costs:	XXXXX	XXXXX		XXXXXXXXXXXX	
a. Cost for area	XXXXX	XXXXX		XXXXXXXXXXXX	
b. 11% for indirect or overhead costs	XXXXX	XXXXX		XXXXXXXXXXX	
c. Total cost	XXXXX	XXXXX			
d. Cost per MBM	XXXXX	XXXXX			
pared: DateSigned			Title		
			LAU	(Field Officer)	
proved: DateSigned			Title		
				(Supervisor's Office) (OVER)	

						1				
						· .				
		1				!		4	ĺ	
			· ·							
	, r						,			
			- 1					·		
1										
		1								
						,				
									1	
				İ		1				
				,						
	*									
ŀ										
			1							
			1							
										-

			Į					1		

Scale:inches = 1 mile

Remarks:

Light Selection: In areas cut on a light selection basis, accumulated slash and other dry fuels should be disposed of along roads. As a minimum, fuels along all permanent roads and all those to be temporarily maintained and used for the duration of the special hazard, should be cleaned up. Uniform clean-up width is not necessary; the width will vary with conditions, but in general, it should be wide enough that a ground fire could be stopped at the road provided the burning index value was not greated than 35. Except for unusual cases, the width will vary from 25 to 100 feet on each side of the road. In addition to treating roadsides, the accumulated fuels should usually be disposed of around landings (landings used in winter are seldom hazardous), around forest or hunter camps, adjacent to experimental plots or units, around water holes or other stock watering places, and along fishing streams; and in some cases, adjacent to fences and next to other ownerships.

If light, selectively-cut areas contain considerable mixed species such as lodgepole pine, white fir, or Douglas-fir and a greater volume of hazardous fuels is created in logging than in ordinary pure ponderosa pine types more fuels may have to be disposed of than prescribed above. Some of the tractor skidding trails or ridgetops should be treated and occasionally slash should be disposed of in creek bottoms, in dense reproduction thickets, or in other specially hazardous areas.

If large, continuous areas are cut over and no wide natural firebreaks are present, the accumulated fuels on strategically located strips at least 10 chains in width at intervals of not over three miles will be disposed of. The strips should be along roads if possible, but advantage should be taken of natural openings, ridge tops, areas of light slash and existing or planned firebreaks.

Heavy Selection: In areas cut on a heavy selection basis, the objective should be to reduce the accumulated slash and other dry fuels to the same degree as exists on lands cut lightly after the fuels have been disposed of. To accomplish this, fuels should be disposed of on ridgetops, along skidding trails, in thickets, in canyon bottoms, around the edges and along uncut timber, along areas cut on a light selection basis, or by connecting treated roads together with firebreak strips which will be in addition to the treatment prescribed for areas cut on a light selection basis. (To accomplish somewhat the same objective on private lands, cut on a heavy selection basis, the slash may have to be judiciously spot burned, but the spots should be lined and this burning done in very favorable weather without damaging the residual stand; or if the stands are cut very heavily about 50% of the slash should be disposed of. mainly along roads, without burning over 20% of the area unless the owner will furnish adequate intensive protection in lieu of some of the disposal by burning. Many private owners now confine disposal work to clean-up along roads; others depend wholly on subsequent protection; some contract the slash disposal and extra protection to the Forest Service through cooperative agreements (See I-2-21).

Sample Map. See Figure 1.

Douglas Fir Selectively-Cut Areas. Selective cutting in Douglas fir is apt to create a difficult slash disposal and protection problem. Because of wide differences of conditions, it has not been considered practical to formulate definite uniform standards for slash disposal measures throughout the region. It has been found that improper cutting practices result in the creation of a slash hazard that is impossible to reduce to acceptable protection standards with any reasonable expenditure of funds. Therefore, it is important that hazard-reduction plans, if possible, be prepared and correlated simultaneously with the preparation of timber appraisals and cutting-practice stipulations or plans. The following cutting and slash-disposal practices will serve as guide lines on national forest lands, and other owners should be encouraged to adopt and follow them if they are cutting their lands on a light-selection basis.

Amount and Method of Cut: One of the major factors in determining the amount of the gross volume that should be cut is the resultant slash as related to reduction and to intensive and/or subsequent protection. The cut should be sufficiently light so the slash problem can be solved in a reasonably practical and economical manner.

In ordinary even-aged mature stands, usually not over 33% of the gross volume of old growth should be removed during the initial cut because of the hazardous conditions created. In two-story stands, the gross volume cut might be much higher. In the drier areas, such as on exposed south or west slopes or in the interior of southwest Oregon, the cut should be lighter than elsewhere. Clean-up adjacent to recreational areas should be much more intensive than where these high values are not prevalent or the risk is light. Hazardous fuels should be less in volume in east-west valleys than in north-south valleys. Hazardous fuels should be less in volume in old decadent stands with dead tops, defective trees, snags, windfalls, and a combination of scattered reproduction and natural ground fuels than in a clean stand with light natural ground fuels. Good judgment is required in every case. Exceptions may be made where the hazard is to be reduced considerably by disposal of most of the created slash and debris. Subsequent cuts should not as a rule be made until the previously created slash has reached a normal hazard (not more than a medium-rate-of-spread fuel type).

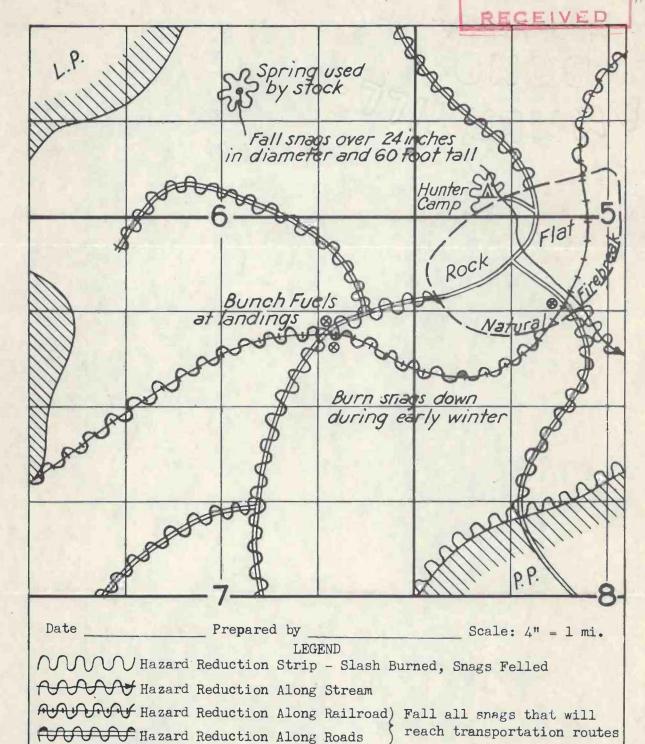
Size of Areas: Large, continuous selectively-cut areas should be avoided unless most of the slash can and will be disposed of. Separator strips of green timber, either uncut or with slash completely disposed of if partially cut, 5 to 10 chains or more in width, should be left at about one-mile intervals where slash is partially disposed of. The strips should be as strategically located as possible from the fire standpoint, but need not be uniform in pattern, location, or size. They should contain no concentrations of heavy dry fuels or any tall snags. Since the purpose of the separator strip is to have available a suitable place for making a stand against a supported crown fire, the strip should be fairly free of dry fuels or the fire cannot be brought to the ground. All inflammable debris on any transportation routes transecting the separator strips should be disposed of. If possible, long road tangents should be avoided within the strips.

Degree of Cleanup: Accumulated slash and other dry fuels should be disposed of along all roads which are to be temporarily maintained and used through the period of extra hazard as well as along all roads on or to

SAMPLE SLASH DISPOSAL MAP SELECTIVELY-CUT PONDEROSA PINE AREA

k 1 1011

AUG 4 - 1944



& Landings to be Cleaned up

Will Green Timber Boundary

L.P., P.P. etc. Timber Types

___ Non-Forest Boundary

be placed on the permanent all-purpose transportation plan. The width of the roadside (or logging railroad) strip on which the fuels are to be disposed of will vary with conditions, but as a basic rule it should be sufficiently wide to permit taking control action with safety on a non-crown fire when the burning-index value is 30 or less. The width might vary from 25 feet on each side of the center line of the road in a green creek canyon to 75 feet or more on each side of the center line of the road on a dry slope or ridgetop. In addition, the accumulated fuels around summer landings will usually be disposed of. In special situations, such as very dry sites, nearly moderately or heavily-used areas, along popular fishing streams, next to old burns, snag patches or clear-cut areas, it will usually be necessary to do additional clean-up work in the special areas or to prepare additional firebreaks by clean-up of tractor-skidding trails. If the above, plus reasonably intensive protection for a few years, is not adequate, then consideration should be given to additional disposal or to reducing the gross volume cut.

Sample Map: See Figure 2.

Clear-Cut Areas

Many conditions need to be considered in deciding whether or not to burn slash on clear-cut areas. A number of conditions in favor of burning slash follow:

- 1. All but very small areas of extreme-rate-of-spread slash fuels of either extreme or high resistance to control should be burned.
- 2. High-rate -of-spread slash fuels in areas of high risk should be burned.
- 3. If the operation is by logging railroad, burn more than if it's a truck operation with an opportunity to provide subsequent intensive protection.
- 4. Burn heavy accumulations around landings used in the summer, in draws and canyons, at the foot of steep slopes and concentrations in decadent stands provided burning can be forced and be done safely after the necessary preparatory work.
- 5. If continuous clear-cut areas must be extensive, over 80 acres, more strips or more area will need to be burned than if clear-cut areas are small.
- 6. Burn the first burning season after logging if possible. Burn in advance of fall seed dispersal if possible.
 - 7. Burn more in east-west valleys than in north-south valleys.
- 8. The cost of slash disposal should be exceeded by the benefits derived.
- 9. If large areas have to be burned, it is an indication of unsatisfactory cutting or logging methods.

A number of conditions in favor of leaving slash unburned follow:

- 1. Slash on steep slopes with light soils or rock outcroppings should not be burned.
 - 2. Seldom burn low or medium rate of spread slash fuels.
- 3. If over two seasons old do not burn or do not burn after the first year if restocked with seedlings.
- 4. Do not burn areas with a residual stand of poles or many decadent standing trees if by so doing the poles or trees will be killed and the long-time hazard will not be decreased.
- 5. Do not burn if the area can be given reasonable intensive protection at the same approximate cost as burning.
 - 6. If undue chances must be taken with burning, do not burn.
- 7. Burn little or lightly on cool moist slopes or in damp stream bottoms.
- 8. Do not burn areas where the residual stand is composed mostly of thin-barked species.

The decision as to burning the slash or leaving it unburned should be made when logging plans are made in advance of cutting, but minor revisions may have to be made after the areas are logged. When it is decided that the volume of debris resulting from clear-cutting old growth Douglas-fir stands is so great that all or the worst accumulations of fuel must be eliminated, then broadcast burning is the only disposal method now recognized as practicable.

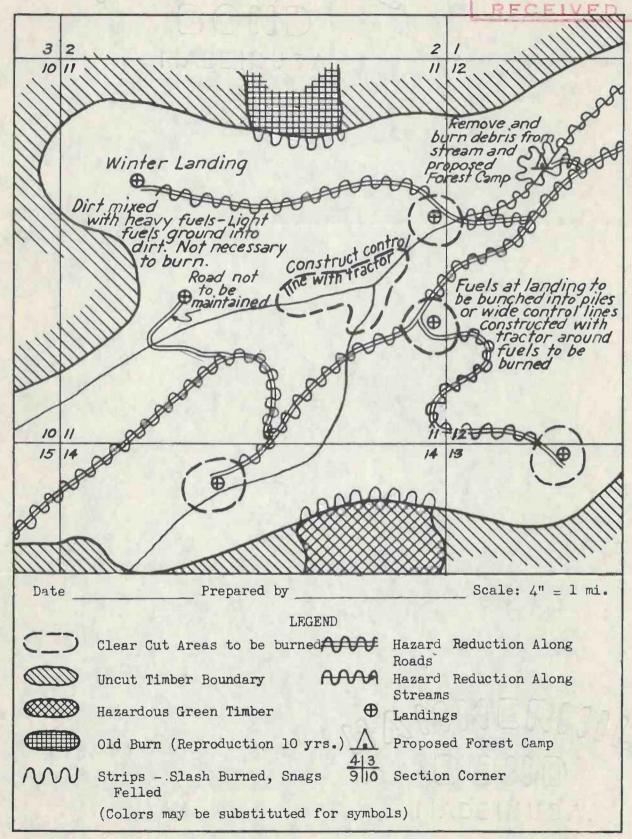
Advance Planning

There are certain logging practices or methods that should be advocated in order that clear-cut slashings can be safely and adequately burned, or intensively protected, or both. Advance planning through timber management and logging plans should provide for the following:

- l. Consideration should be given to disposal of slash at time of preparing logging and presale plans for the working circle or other timber management unit in order that clear cut slashings can be safely burned on present and future cutting units. It is particularly important to give consideration to boundaries of future cutting units so that the slash on them can be disposed of without endangering cut-over units on which reproduction has become established.
- 2. Plan the logging for a large unit so that only small continuous areas of unburned slash or clear-cut areas result—60 acres maximum is a good objective. Small units are the key to safe slash burning, control of accidental fires, and low cost intensive protection. Leave separator strips of green timber, logging only alternate settings or units and then coming back later for the alternate settings, after reproduction has reached a size to form a closed canopy. Leave settings of green timber in the most favorable locations

SAMPLE SLASH DISPOSAL MAP SELECTIVELY-CUT DOUGLAS-FIR AREAS FOREST SERVICE
Northern Racky Mountain Forest
and Bange Experiment 5 in
MISSAGE, Grants

AUG 4 - 1944



such as across the mouths of canyons, at stream intersections, at sharp bends in streams, at narrower places in canyons, to connect young clean stands of timber, in major stream bottoms, and adjacent to other owners. Settings need not be wide enough to prevent a fire from spotting across them; they can be considered adequate when they are of sufficient width to prevent a fire from being driven through by the heat when adjoining areas accidently burn on a day when the burning index class is not more than one class above normal. Settings between clear-cut areas should usually, as a minimum, be not less than the width of adjacent clear-cut areas. Settings will need to be wider if slash on adjoining lands is to be left unburned or if subject to strong prevailing winds. If clear-cut areas are excessively large, uncut areas may need to be almost one-half mile on the flanks and up to one mile wide on the front.

- 3. The shape of the cutting unit should be varied to fit the topography insofar as plans for regeneration and logging methods will permit, as follows:
- a. The top cutting boundary, which is usually the most critical, should be located on a ridge top, bench or other similar break in the slope.
- b. Side lines should be straight and at right angles to the contours.
- c. Seldom should a cutting boundary be located in a deep, dry, narrow ravine where heavy accumulation of slash usually occurs. Hold-over fires are common in these concentrations and present a danger point for escape of slash fires. Where conditions require a cutting boundary in the bottom of a dry ravine, locate it on the opposite slope far enough up to permit construction of a clean firebreak and fire line of sufficient width to stop a creeping ground fire and to permit a holding crew to work efficiently. Where the fire line is located in a creek bottom and it is the plan to have the creek serve as the fire line, eliminate all windfalls and log jams across the creek on which a ground fire could cross.
- d. Cutting units should be located on one exposure (cutting units on two exposures are undesirable).
- 4. Planning logging road location on exterior boundaries of cutting unit benefits slash disposal as follows:
 - a. Provides a good fire line.
- b. Provides the best possible transportation route for work crews, for tank trucks used in the control of the slash fires, and for subsequent patrol. It is particularly advantageous to locate the logging road on the exterior boundary at potential fire escape points such as in saddles where the updraft will be strong and along draws or ravines where hold-over fires are likely to occur.

Advance Preparation

Certain precautionary work, usually required of the logger, is necessary to insure a safe burn, as follows:

- l. The cutting unit should be completely lined either with tractor trails, hand line, roads or natural firebreaks. Preferably fire lines should be constructed prior to felling of timber to clearly mark the cutting boundary, to provide a route of travel for work crews, to provide a place from which to work in case of accidental fire during operating periods, and to avoid last-minute interruption of logging to get fire lines built prior to slash burning. In the construction of bulldozer lines, care should be exercised to prevent burying debris because of the danger from hold-over slash fires in this material. Where tractor lines are constructed before felling and logging, there is less chance of debris being buried and more chance the tractor berm will be broken down by the logging operation.
- 2. Felling of green timber in and away from fire line will facilitate control of slash fires by reducing fuel concentrations near line.
- 3. All snags (short and tall) adjacent to the fire line (inside and outside) must be felled prior to burning. Snags required to be felled by the timber-sale contract in the adjacent green-timbered strip should be felled currently with the purchased timber.
- 4. Slash and logging debris outside and adjacent to the fire line should be either dragged inside, piled and burned, or the fire line should be extended around the debris so that it will be inside.
- 5. Logging slash and logging debris concentrations at the entrance to connecting road through the green timber should be either pulled into the slash area and scattered or placed in small compact piles so that they can be burned under control prior to setting the main slash fires. The same applies to slash in saddles and other locations subject to strong air currents.
- 6. Construct tank filling and pumper stations, preferably early enough in the fire season to be of value in case of an accidental operation fire.
- 7. Locate emergency water tanks filled with water at danger points on the fire line for use to fill backpack cans, for gravity-hose system, or for use with portable pumps. The backpack cans, hose or pump required to spread the water should be located with the tank.
- 8. Install and maintain daily record of fuel-moisture sticks in the slash and in adjoining green timber for a period of at least 15 days prior to the probably slash-burning period. Fuel moisture offers the best index for determining when slash is dry enough to burn following a rain and whether moisture conditions in the green timber are sufficient to prevent the start and spread of spot fires. The ideal fuel-moisture conditions for slash burning will vary, depending on slope exposure, density and type of timber, and ground cover of the adjoining green timber. An average good moisture condition for burning in the Douglas-fir type appears to be a fuel moisture of not more than 14 in the slash and not less than 20 in the green timber.

9. Preparation of unit slash burning plan. This plan will consist of a map and narrative statement. (See sample, page I-2-16a.)

The narrative statement should include the following:

- a. Fuel moisture and weather conditions desired such as fuel stick reading in slash and in green timber, amount of rain, wind velocity and direction.
- b. Time of day to begin setting fire, firing sequence and timing.
 - c. Man-power needs as follows:
 for setting fires
 for holding fires
 for emergency firefighting
 for mop-up
 for patrol

Sometimes the same men will do all functions mentioned above such as would be the case if only one unit was burned. On the other hand, if there are several units in a drainage to be burned or a few widely scattered units on a ranger district, plans should be made to provide men for holding and mop-up patrol work. Day and night mop-up patrol should be planned and employed until the possibility of strong winds fanning smoldering fires out of control is definitely past.

d. Equipment needs such as torches, transportation for crew, emergency firefighting tools, tankers, portable pumps, hose, emergency water tanks and radios.

The map should be on a large scale preferably 8" = 1 mile and should show the following:

- a. Starting point and progression for setting fires.
- b. Location of water holes, tanks, and portable pumpers.
- c. Critical control points both natural and where caused by slash either inside or outside.
 - d. Areas where slash is not to be burned.
 - e. Interior control lines.

Slash Treatment Methods

There are many techniques employed in the treatment of slash. They can be used singly or in combination. Each technique is designed to meet a specific need of the forest manager.

The ones most commonly used are: (1) supplemental additional protection in lieu of actual disposal, (2) piling and burning, (3) swamper burning, (4) lop and scatter, (5) broadcast burning, and (6) chipping.

Some of the combinations employed to dispose of slash are: (1) piling and burning along roads which disposes of 3 to 10% of the slash and providing supplemental additional protection for the remaining 90 to 97%, and (2) broadcast burning concentrations of slash in clear-cut areas and providing supplemental protection for the remainder.

A detailed description of the principal methods follows:

Supplemental Additional Protection

Little slash or debris is disposed of by burning in selectively cut Douglas-fir or ponderosa pine except by piling and burning accumulated fuels along roads. Less slash is being burned on Douglas-fir clear cut areas. In lieu of complete or extensive reduction of accumulated slash fuels by burning, it is often possible and desirable to substitute intensive protection throughout the peak of the extra hazardous period. Reduction plans for burning or for intensive protection, or for a combination of both methods, should be based on obtaining the most protection for expenditures made and at the same time meeting the objectives of forest management or other land use. Methods will vary by ownerships, owner's intent, and cutting practices. The guide lines contained herein apply to all national forest lands and to other lands as applicable.

Intensive protection measures are those in addition to regularly financed fire control activities or normal measures. The intensity and specific measures taken will vary with the location and size of hazardous areas, risk, fuels, topography, values, available funds (regular fire control or cooperative work funds) and the many other factors affecting protection plans and action. Intensive measures should be closely correlated and integrated with normal protection measures.

Intensive protection measures will consist of such applicable items as:

l. Detection. Areas of special hazard should be given as nearly perfect detection as practicable during periods of variable fire danger. Generally, the detection might be furnished without additional cost by regular lookouts, by those working in the area such as loggers or slash or snagfalling crews, by cooperators or by regular patrolman or fireman. Sometimes it will be necessary to employ temporary lookouts chargeable to slash-disposal funds in order to meet the above-mentioned objectives. Generally, a hazard-ous area should be covered by a regularly established lookout on a regular or emergency lookout point within 8 miles or less on the west side and 15 miles on the east side, at least by indirect visibility.

(SAMPLE) Slash Burning Map and Narrative Statement

	T. 5 S.	R. 6 E. Sec.	27 Subdiv.			N.F.
	Mapped by	TM	. Reviewed by	DR	Scale 8 inches	= 1 Mile
					t 24,	
	Sale Desig	mation				
:	: :	1 :			: :	: :
: .						
	: :			: :		• • • • • • • • • • • • • • • • • • •
	• • • • • • • • • • • • • • • • • • • •					
	• •					
			• •		Starting poin 2 directio	t for firing
:	• •		• • •		XT	
			• • • • • • • • • •			
			h	- El		· · · · · · · · · · · · · · · · · · ·
				(55)		
:				(5)::::		• • •
				Creek	Legend	
			Trout P	7	P - Portable pum T - Water Tank TTr - Tank Truck X - Starting poi	nt for firing
			Re-		- Firing direc	tion
		T. Te	2			,
						* * *
. ,			Sec.	7		
		Locat	ion Water	Starting point l direction	for firing	
		- Indicate of	PRODUCTION OF THE PROPERTY OF		P-6 F C U	12.1.

- a. Burn on drying out period after 1-2"rain.
- b. Fuel moisture in slash timber more than 18. Humidity 30+. 'more than 18. Humidity 30+.
- c. Duff in green timber should' be moist.
- but can tolerate natural up-canyon drafts.
- at point indicated on map. (This is ' around 3 p.m. at point indicated on most critical point.)
- f. The first strip of fires against line should not be over 10 feet wide and narrower where fuels are large and concentrated.
- strip should not be more than 20 feet wide.
- h. Fire third strip when heat ' has subsided on second strip.
- i. Use 2 fire setters and 2 men holding.
 - j. Equipment needed:-
- 1 tank truck 2 backpack cans (BP cans are in place) Hardite carrier tank filled with water (tank in place) portable pumper w/1000 ft. hose (in place at bridge) h shovels
- 4 pulaskis (1 shovel and 1 pulaski convenient for emergency use of fire setter)
- 3 drip torches and 2 extra torch fuses
- 5 gallons torch oil

R-6 F.C. Hdbk.

k. Mop up from the fire line ' should be commenced as soon as area ' should be commenced as soon as area has been burned and continue until ' has been burned and continue until

- a. Burn on drying out period 'after 1-2" rain.
- b. Fuel moisture in slash should should be less than 14 and in green 'be less than 14 and in green timber
 - c. Duff in green timber should be moist.
 - d. Calm conditions preferable ' d. Calm conditions preferred ' but can tolerate natural down-canyon ' drafts.
 - e. Start firing around 9 a.m. ' e. Start firing in afternoon ' map. (This is most critical point.)
 - f. The first strip of fires ' against line should not be over 10 ' feet wide and narrower where fuels ' are large and concentrated.
- g. Fire second strip when heat' g. Fire second strip when heat has subsided on first strip. Second has subsided on first strip. Second ! strip should not be more than 20 feet ' wide.
 - h. Fire third strip when heat has subsided on second strip.
 - i. Use 1 fire setter and 2 to 3 ' men holding.
 - j. Equipment needed:-
 - ! 1 tank truck
 - 1 2 backpack cans
 - ! 1 Hardite canvas tank filled with water

 - ! 1 portable pump w/1000 ft. hose
 - ' h shovels
 - ' 4 pulaskis
 - ' 2 drip torches

with holding crew; others located ! Note: water tank, BP cans, portable pump and hose should all be in place ! and tested prior to firing.

k. Mop up from the fire line all danger of fire escape has passed. all danger of fire escape has passed.

- 2. Communication. Those being depended on as detectors of firegoers* should have communication facilities, either telephone or radio.
- 3. Prevention. In addition to the usual prevention devices and methods, full use should be made of entry and smoking closures, logging operation fire plans, special patrols, and enlisting the positive support of each forest user or employee. Occasionally, employment of a prevention guard is justified for a hazardous area or a drainage containing several slash areas.
- 4. Transportation. Fast action on any fire is primarily dependent on automotive transportation. The necessary frequency or spacing of roads will depend primarily on fuels, topography, availability and size of fire crews, and availability of suitable fire equipment. A definite standard cannot be prescribed for every situation. Extreme rate of spread fuels should be reached in one half hour or less; if possible, they should be reached in less time the first and second years after the slash is created. For fuels with a lower rate of spread, the maximum travel time may be increased. If truck or logging roads are available, they should, in most situations, be maintained in passable condition for the duration of the special slash hazard at a frequency of one quarter to one half mile apart for extreme rate of spread fuels (as a rule, only limited areas of extreme rate of spread slash fuels should be left unburned), one half to one mile apart for high rate of spread fuels, and one to two miles apart for medium rate of spread fuels plus high or extreme resistance to control. In all other slash fuels, plans will provide for reaching the area in accordance with regional standards for travel ($\frac{1}{2}$ hour for extreme rate of spread, 1 hour for high rate of spread, 2 hours for medium rate of spread and 4 hours for low rate of spread fuels). Many of the utilization and truck roads will be carried on the permanent all-purpose transportation plan. Other roads, when needed only for protection, such as spur utilization roads, will be carried on transportation plans in a temporary status during the peak of the special slash hazard of 3 to 5 years or in exceptional cases up to 8 years. They should be constructed to such a standard that they can be easily and cheaply maintained in a passable condition; and they should be dropped from transportation plans just as soon as they are no longer needed to meet the foregoing frequency standards.
- 5. Equipment. Often special equipment will be found necessary to perform an efficient job. Special water-radio equipped pickups for patrolmen or smokechasers, and slip-on tanker outfits and trucks are some of the special items of equipment to consider.
- <u>6.</u> Crews. The location, size, and character of crews available for piling or bunching slash, for falling snags, for stationing in the hazardous areas on days of high danger, or for fighting a fire should be carefully planned as they will to a considerable extent determine the intensity of protection given an area.

^{*}A smokechaser, a fireman, a seasonal suppression crew, a hazard reduction crew or any firefighter who will take initial action on a fire.

Piling and Burning

The principal distinction of this method of slash disposal is that the slash is first piled and then burned at some later time. It is used mostly for disposal of slash in selectively cut timber.

Piling Slash and Debris: In piling or bunching slash in selectively-cut areas, emphasis should be given to the removal of accumulated fuels. "Needle picking" or "pitch-fork" work is costly and usually unnecessary from a fire-suppression standpoint, although it might be desirable in some cases for prevention reasons along heavily-used public roads, as would a fire line constructed by a bulldozer or a tractor plow near but parallel to the roadside. The main objective of preparing a firebreak is to eliminate the dry fuels that would produce a lot of heat, scatter sparks, push fire into the crowns of reproduction or residual trees, or make it difficult to hold a backfire. Pitchy stumps, old dry or pitchy logs, limbs and witch brooms should be removed in any firebreak, as they are heat producers and cause crowning conditions. The very light flashy fuels cause little trouble when a road or other prepared place is used as a fire line; often they aid rapid and safe backfiring.

Several methods are employed to pile slash. The ones most commonly used are: (1) hand piling, (2) rick piling, (3) tractor piling, and (4) cable piling.

Hand Piling: To obtain satisfactory results, the essential points to observe are:

- l. Select the best location for the pile. It should be near the debris to be piled, but far enough away from green trees or reproduction so they will not be scorched or burned when the pile is burned. Piles should be at least 15 feet from trees with low crowns. In all recreational areas or those having scenic value, piles should be located in spots free of all green material so none will be damaged. In these instances roads will have to be used if other suitable openings are not available or the debris will have to be hauled to a suitable location where it can be burned without damage.
- 2. Prepare the debris for piling. Chop dead limbs from tops, cut large limbs or chunks in sizes that can be handled, split large material if necessary, cut off dead brush with axe, brushhook or shears, remove dead limbs from green trees with pruning shears, club or saw.
- 3. Pile the prepared debris in the selected spot. Place large dry material on the bottom. The fine green or damp material should be placed on top. The pile should be compact so it will shed rain; it should look much like a good hay shock.
- 4. Use of paper to cover piles is recommended practice to permit burning when fires will not spread. The paper covering should be inserted in the pile when piling is about two-thirds completed. A waterproof laminated 30-30-30 kraft paper in rolls 48" wide has been found most satisfactory and most economical for this use.

- 5. The size of the pile will vary by the amount and kind of material, and the location of the piles. Large piles usually burn the best. Large piles may be made in large openings and smaller ones in small openings. Piles will vary from 6 to 10 feet in diameter and 5 to 7 feet in height.
- 6. To assure complete burning, without extra work to "chunk in" the fire, piling should be done sufficiently in advance of burning so the debris will have a month or so to dry.
 - 7. Good crew organization practices for hand piling are:
- a. Limit the crew under a fireman to 10 to 15 men -- the number will depend on the intensity of the work and the experience of the crew members.
- b. Grew members should be well spaced. Each member of the crew should be assigned a station; 100' to 200' in length. Each crew member should work independently unless heavy material must be moved which cannot be handled by one man.
- c. If cross-cut saw work is required, the bucker should work ahead of the pilers.
- d. Crew members must be trained in the use of tools so they can use them safely and expertly. Preparing debris for piling and then laying the axe well to one side when piling will safely speed up the work. Gloves should be worn where there is poison oak.
- e. Tools should be kept sharp. Such items as battered wedges, loose handles, and rounded axe corners must be conditioned immediately or the tools replaced with good ones (have extras available).
- 'f. The limits of the area to be cleared or treated should be staked on the ground so each crew member will be certain as to work limits. If there is any question as to the best location of piles, each selected spot should be staked in advance.

Rick Piling: In the wetter portions of the Douglas-fir Region, piles may have to be made in the form of ricks when the slash is piled during the summer in order to have a dry pile for burning in the fall. The rick is started by placing two logs, 6 inches or larger in diameter and about 8 feet long, parallel to each other but 3 to 4 feet apart. Pitchy material, dry cedar slabs, small limbs and flash fuels are placed on the ground between the logs. Stakes, 4 to 5 feet long, are placed at the end of the logs. Brush, limbs, chunks and other debris are piled crosswise of the logs to the height of a man, and rounded on top for covering to check water. The piled material should be compact. The pile should be covered with a laminated kraft paper such as described above. To burn, the flashy dry fuel between the two logs is ignited.

Tractor Piling (Bunching): A very satisfactory job of piling (bunching) slash and debris can be accomplished with a tractor equipped with a land-clearing blade or special teeth attached to a bulldozer blade. (A bulldozer or angle-dozer blade is not too effective in bunching slash and debris because of the amount of dirt pushed into the piles.) Tractor piling is recommended where topography permits and damage to trees and reproduction

can be held to a minimum, or where it is desirable to purposely scarify the ground to make a better seed bed. This method is very effective in open ponderosa stands where the slash and debris consist of large dry pitching spike tops, dry logs and large limby tops. Essential points to observe in the use of slash-bunching equipment are:

- 1. Select the largest available opening, close to the debris, for the pile. A minimum space of 10 by 15 feet is needed for the pile; in many cases a space 15 x 25 feet will be needed. The spot located for the pile should be no nearer than 15 or 20 feet from reproduction or trees with low limbs since large piles are apt to burn with considerable heat.
- 2. Long logs or poles should be bucked so they can be moved easier and with less damage to reproduction and trees.
- 3. Logs and other heavy dry material should usually be first pushed into the bottom of the pile. Then the smaller material is pushed onto and against the logs and other heavy material. In other cases the two types of material will be mixed. An effort should be made to keep the pile compact; the tractor can be used effectively for this purpose by running the front end onto the pile.
- 4. The tractor route should be planned so the maximum amount of debris is moved each time a pass is made with the tractor. The blade should be kept sufficiently high so a lot of dirt will not be pushed forward with the debris; the blade should be lifted slightly just before the pile is reached.
- 5. Care should be taken not to attempt to bunch all small material, particularly if scattered. It's better to pick up and pile such material by hand if the amount warrants.
- 6. It's best to bunch debris two months or so ahead of the fall burning season so it will have a chance to dry. It is good practice to cover the pile with waterproof laminated 30 30 30 kraft paper so that the slash can be successfully burned when conditions are wet. The paper should be inserted when piling is about half completed. When burning, the piled material should be pushed together, usually by the tractor, so as to facilitate complete disposal.
- 7. If dry debris is being bunched in the late fall, when it's safe to burn, a modified form of swamper burning can be used. A fire is started in a pitchy log or stump and the debris is then pushed directly onto the fire.
- 8. Undue damage can be avoided by skidding tree tops or similar debris from reproduction thickets into the open by use of a choker or a pair of tongs.
- 9. Under ordinary circumstances, the debris-bunching crew should consist of at least three members. One spots the location for the piles, designates the debris to be bunched and supervises the work; the second operates the tractor; the third swamps for the tractor, cleans up small material behind and trims branches protruding from the piles to make them lay flat.

Cable Piling*: Various equipment can be used such as a tractor or truck mounted crane, a cherry-picker, a gin or spar pole and tractor with double drums, and various block-and-tackle methods. Conditions where the line method may be applicable are as follows:

- 1. In recreational areas where heavy material has to be moved without damage and the equipment must be worked from a road. A crane or cherry-picker can be used to either pile the material on the road or load it for moving elsewhere for burning.
- 2. Where there is a large volume of heavy material such as logs, making a large pile around a spar pole, or skidding the logs and then stacking with the use of a cross haul are effective methods.
- 3. In clear-cut areas where debris has to be moved prior to burning from the edge of the green timber, some form of line method should be used. Logs should be bucked into 8-foot lengths if they are to be loaded crossways on a truck.
- 4. If blocks are attached to trees, the tree should be protected with pieces of wood placed underneath all straps or lines.

Burning Piled (or Bunched) Slash and Debris: Most piled debris is burned in the late fall when conditions are favorable for the safe use of fire. For satisfactorily burning piled or bunched debris, the essential points to observe are:

- l. Burn when it's safe in order to avoid scorching of trees or reproduction or taking chances the fire will escape. If there is any danger a fire will escape, even by an unexpected wind or other change in weather conditions, the fire should not be left unattended even at night. The fire should be kept confined to the piled or bunched material at all times.
- 2. Pumpers, tankers, line building tractor and line building tools should be held in reserve for use in promptly cooling down a hot fire or controlling one that starts to spread.
- 3. Equipment for firing piled or bunched slash consists of drip torches, power and pressure flamethrowers and treated shavings. Equipment producing a hot flame is needed for heavy or damp fuels; other equipment is suitable for dry piled slash. For further details on slash-burning torches, mixture for treating shavings, or other equipment, reference should be made to the Fire Control Equipment Handbook, Section 4.
- 4. The key point to satisfactory burning is selecting the right time—when the debris will safely burn readily without damage to trees,

^{*}Additional material will be found in the "Forest Road Handbook" and other Engineering instructions.

reproduction or green brush to be saved. When conditions are right, push the job; when conditions change so fires will spread or burn too hot, discontinue burning immediately.

- 5. If piles are close together or burn hot, light every other second or third pile and then return later to burn the others. On slopes, burn the piles at the top first. If the wind is blowing, burn the piles on the leeward side first and light each pile on the lee side.
- 6. The burning crew should consist of 3 to 5 men under an experienced leader. One or two men will light the piles and 2 or 3 will tend the burning piles—chunk in material so as to obtain a good cleanup and to prevent fires from spreading.
- 7. If any trees, brush, or reproduction are accidentally killed or scorched, the killed or scorched material should be placed on the fire and burned up.

Swamper Burning in Selectively-Cut Areas

Swamper burning is the method of piling and burning the accumulated fuels in one operation. It is commonly used in the late fall or in the winter where a good cleanup job of heavy fuels is desired and there is no danger of fires spreading. A fire is started with dry wood and as soon as it is burning well, the nearby fuels are piled or rolled on. No great amount of heat is created at one time, and an unlimited amount of debris can be disposed of in a single spot. Swamper burning is feasible in fairly dry weather if a tanker or pumper outfit is maintained on the job (handling over 300 feet of hose is costly and should be avoided). This method can be used in very wet weather. Considerable judgment is necessary in the placement of fires, which should be away from live trees but in a location to take care of the maximum amount of fuels with the minimum of handling. Other considerations are as follows:

- 1. Selection of the best location for burning and preparation of the debris for burning are as described under 1 above, "piling in advance of burning".
- 2. Fires should be started in the selected spot by use of dry or pitchy wood. A good hot fire is needed if much damp or green material is to be burned. A plentiful supply of dry cedar, Douglas-fir bark or pine limbs will produce a hot fire even under adverse conditions.
- 3. Once the fire is well started, the surrounding debris should be placed on it. The kind and amount will depend on the dryness of the debris and the possibility of damage to nearby trees or green growth. The amount of heat can be easily regulated by the amount of the debris placed on the pile at one time.
- 4. The fire should be kept compact by chunking in the larger material. This will also insure complete disposal.

Lop and Scatter

The principal characteristic of lopping and scattering slash is that the branches are cut from the felled trees and placed in some other location to decompose by natural means. Sometimes the slash is scattered over shallow soil to check sheet erosion, sometimes it is placed in tractor trails to be chewed by the tractor treads, and at other times the branches are placed in dry washes to check gully erosion.

Chipping

By this method the slash is reduced to chips. A machine (chipper) is required for this purpose. This method of slash disposal is being tried out on an operational basis this year. Little is known at this time on the techniques of organization that will produce best result or the probable cost.

Broadcast Burning

The forestry objectives in broadcast burning slash are:

- l. To remove flash small material in which dry-weather fires spread with such speed and heat that they can seldom be controlled inside of the slash area,
- 2. To burn apart crossed and closely lying logs, separating them where great heat can be developed and thus make an accidental fire more intense and difficult to control,
- 3. To check the growth of brush that sprouts from roots and competes with tree seedlings,
- 4. To remove excessive debris that would prevent tree seeds from reaching a suitable seedbed,
- 5. To accomplish as far as possible the foregoing aims without scorching adjacent standing timber or causing undue heat injury to the soil and seed trees within the slash area,
- 6. To aid tree planters do a better and cheaper job of planting trees by removing most of the fine ground covering and large obstructions that hinder the planters in finding a place to plant the trees and in traveling.

Choosing the Slash Moisture Conditions for Burning: Since one objective of broadcast slash burning should be to avoid undue heat injury to the soil, seed trees, and adjacent timber, the soil should be moist in both the slash area and adjacent areas. Yet to allow economical firesetting the fine material should be dry enough to carry fire and be easily kindled. In the light of these requirements, fall burning just before an expected rain presents several disadvantages:

- 1. The soil, duff, and logs on the slash area will usually be dry. Such slash generally burns too intensely, and a hard burn is destructive to soil structure, soil humus content, and seed trees.
- 2. If the slash is very dry, the adjacent areas also will be dry. Under these conditions, numerous spot fires and break-aways can be expected; this increases the cost of control and causes loss of adjacent timber, equipment, or other values. Even though timbered areas may be fairly damp, the exposed edges for several hundred feet inward may be almost as dry as the slash area. Hemlock and spruce, which are particularly susceptible to fire damage, will die from the effects of a ground fire around their bases.
- 3. The timing and intensity of a rain storm in a given small area are difficult to forecast.
- 4. Most storms are preceded by strong winds; this will increase the danger of break-aways and damage.
- 5. If the rain beings sooner than expected, there generally is an urge to fire the slash rapidly. When this happens, a hard burn is the usual result, and frequently uncut timber around the edges is scorched. Sometimes the slash quickly becomes too wet for the set fires to spread. Instead, they smolder and burn in the concentrations without completely dying out; real danger may occur later with a change to low humidities and increased wind velocities.
- 6. The expected rain may not occur. A serious fire problem may confront the burner in this situation, depending upon adjacent timber conditions and subsequent weather.

Since about 1942 there has been a trend toward doing fall slash burning as soon after a rain as conditions will permit. This method has definite advantages in avoiding heat injury and providing good conditions for burning:

- l. As fast as the fine slash and surface of the coarse slash become dry after the rain, the slash is burned. Since the duff is still wet below the surface, it is completely burned only in the spots beneath logs or piles of hot burning fuels. On the remaining area the fire destroys the light and flash fuels but dies out before consuming the duff and humus in the soil.
- 2. The fine slash will dry out first while the fuel in the adjacent green timber is still wet. The wet duff and damp litter in the timber will lessen the danger from spotting and break-aways.
- 3. The first few clear days following the rain are usually calm and offer ideal conditions for controlling the burn.

- 4. The materials in which the fire spreads can be burned out before dangerous weather develops.
- 5. Under this method it is possible to do the slow burning that does the least damage to forest soils, seed trees, and surrounding timber. More time is usually available for setting the fire in successive contour strips down the hill. This avoids a sweeping and excessively hot fire.
- 6. Where one person or one crew has responsibility for burning a number of slash areas, this system offers a longer period in which to do the job. In this way experienced slash-burning personnel can cover more ground, and better burning results are probable.

Often the ideal burning conditions referred to above will occur for short periods in the late winter (February and March) or early spring (April and May). A few hot days are enough to dry out the slash on some slopes sufficient for it to burn; whereas, the duff in the green timber remains damp or wet because of the shade. Generally, it is unwise to attempt burning accumulations of heavy slash and debris such as result from old growth decadent timber later than April because of the danger from hold-over fires.

In any broadcast slash burning, good judgment in picking the right time to burn is essential to success. The decision on whether to burn early or late in the season will be determined by the general location of the slash area and the burning conditions on and adjacent to the slash area.

A large slash area adjacent to other highly inflammable areas is more dangerous to burn early in the fall than a small slash area surrounded by green timber. Where high-risk burning chances occur, it is advisable to burn late. However, good slash-burning results cannot be expected consistently on such chances regardless of the time of burning. By planning the logging operation well, however, many of the risks can usually be eliminated or minimized. The poor slash-burning results obtained on most dangerous slash areas happen largely because management permits difficult situations to occur.

In stream bottoms and on north slopes of the coast fog belt where dense brush grew before logging, slash should be burned fairly early in the season after the first fall rains occur and under fairly dry burning conditions. This is done to obtain the best possible regeneration of conifers. One purpose of such burning is temporarily to set back the brush in order to give natural regeneration or planted stock a chance to become established. The coastal brush is more of an obstacle to adequate natural reproduction than is commonly appreciated. Unless burned with sufficient heat to kill the tops and injure the root crowns, this brush springs up rapidly when exposed to full light following logging. It will then hold the area it occupies and exclude conifer seedlings.

It is advisable to burn as promptly as possible after the rain—as soon as the small materials and log surfaces have dried enough to ignite easily and while the lower duff layer in the slash and all fuels in adjacent timber are still damp. In selecting the best day, the dampness of the duff should be determined at several points in adjacent timber and in the area to be burned by digging into the duff with the hands. The inflammability of fine fuels can be estimated by the brittleness of twigs. The use of fuel sticks to measure moisture content of fine fuels is good practice. Another method is to burn a small sample of fine slash. If the fire will not spread, burning should be discontinued until conditions improve. Best results are obtained when the fire spreads slowly and many sets are required to ignite the entire area:

Even though the relative humidity is low, the fire can be easily managed if the air is calm and the duff is moist. Successful, controlled, nondestructive slash fires have been observed burning under these conditions shortly after a rain when the relative humidity was only 25 per cent.

Weather Bureau forecasts should be studied before burning and also after burning is under way. The Weather Bureau wishes to assist with slash-burning projects and is glad to provide fire-weather forecasts.

Setting the Fires: In setting the fires, the most dangerous edges should be lighted first and a safety strip should be burned around areas to be left unburned. Topography, wind, and condition of the slash should be considered in the firing progression. In all cases the upward and leeward sides of the area should be fired first. It is best to proceed slowly at first, and edges should be well burned out before setting additional fires. Hot, destructive burning can result from setting off too much area at one time.

Once started, burning should be continued until all fuels within the slash area have been ignited, but burning should be discontinued whenever set fires will no longer spread. Smoldering fires scattered through a large area of unburned fuel are apt to produce an undesirably hot fire when burning conditions become more severe during the afternoon of the next day. To avoid this circumstance, it is also advisable to delay setting more fires until about noon the next day or until such a time as they will spread. Frequently, excellent results can be obtained by burning south slopes and dry exposures during the night, and north slopes, creek bottoms, and other damp areas during the heat of the next day.

Holding Slash Fires Under Control: In burning heavy slash and debris (200 to 400 tons per acre) there is usually a delay between the time the fires are set and the flames reach their maximum heat intensity. Also, the amount of heat generated is tremendous and extends out a considerable distance. The heat will be more intense and extend farther on the top side of the slope and in draws and saddles. During the time this heat constitutes a threat to the escape of the slash fire, additional men

should be employed to cool down the fire, put out spot fires that may occur across the line and wet down the moss and vegetation in the threatened area outside of the fire line. Sometimes an unexpected gust of wind will cause an otherwise well-managed slash fire to escape. In such an event, the holding crew is quickly converted to a suppression crew to control the fire. Fire setters should not be depended upon for holding or for emergency fire suppression.

Mop-Up and Patrol: The importance of mop-up to continuing success of flash burning after a rain cannot be over emphasized. In burning immediately after a rain, dryer weather can be expected. After the slash fire has cooled, any live edges should be trailed and mopped up. The proper time to do this mop-up is while weather and fuel conditions are still favorable for moderate burning. The objective should be to have the edges of the burned slash dead before dangerous weather conditions occur. If the slash has been properly burned under the right conditions, a clean burn will be obtained, and not much live edge will remain 24 to 36 hours after the slash has been fired. A clean burn properly mopped up will not spread fire even though the weather becomes dangerous. Night mop-up patrol should be the rule until danger of strong winds fanning the fire out of control is past.

Even after a good mop-up of the slash fires has been accomplished, there is need for patrol. The intensity of patrol should be varied depending on such factors as degree of cleanup, elapsed time following mopup and weather conditions. Patrol should be more frequent where there remains deep concentration of unburned or partially burned fuels, immediately following mop-up and as burning conditions become more severe, particularly if east winds occur. During critical periods, both day and night patrols should be maintained. It is good practice to maintain resident patrols on or near the areas burned during critical periods such as the first 24 hours after the fires are set and during east wind periods. All patrols should be provided with good tanker equipment if available.

Recreational Area Cleanup (Surveys and Plans)

Introduction

Any cleanup or fireproofing work to be planned hereunder will con sist of such additional work as should be done and has not been done or is not included in recreational area development plans. In many cases all of the necessary cleanup or fireproofing work has been done or will be in cluded as a part of recreational area or tract development plans. Such planned work should not be duplicated by the preparation of a special and separate cleanup plan.

Objective and Priorities

The objective of recreational area cleanup is to so fireproof recreational or heavy publicly used areas that a fire under normal conditions will not spread from the used area to the surrounding forest nor spread from the surrounding forest to the used area. Recreational areas have a very high value; they should be given intensive protection—the highest priority is fireproofing by cleanup; extreme and high rate of spread fuels should always be eliminated. All cleanup involving areas heavily used by the public and special cases will be included here if not otherwise included in plans for snagfalling, roadside cleanup, or recreational area development plans.

Priorities will vary in accordance with amount and kind of use and fuel types. In general, priority should be given to treating areas with critical fuels where the public use is heavy. Priority will be given to snagfalling, removal of light dry fuels, and construction of fire lines in cheatgrass areas.

Cleanup Jobs

The following are guide lines. Situations vary so widely throughout the Region each case will have to be treated differently. Amount and period of use, fuel types, occurrence of fires, topography, availability of prevention and suppression forces, and availability of water and equipment are a few of the items which should be considered in making project plans for clean up. Various cases are described as follows:

1. All cases:

a, Fall all snags in the area and for 300 feet around the outside of the exterior boundary or use limits. (A radius of 100 feet may be adequate for small hunter camps used only in the late fall.)

- b. When possible to do so and when the recreational use or value is not otherwise impaired, plans should provide for, (1) concentrating use between a stream or lake and a main or service road; the road should be constructed to the rear of the used area and near the toe of any unusable slope, (2) having sufficient turnouts in service roads to permit fire tankers entering the area when traffic is heavy, and (3) for placing fire hose taps in water lines.
- c. Caution: In all recreational areas extreme care must be taken to not cut, remove, or injure green growth or material needed for screening unless disposal is specifically provided for in cleanup or development plans. Tractors or other heavy equipment should not be used for clean up work unless especially provided for in recreational plans.

2. Forest camps:

- a. Dispose of all fine dead and dry fuels such as dead limbs, bark, concentrations of rotten wood, and dead brush, that would cause fires to start or rapidly spread within the used area and for at least 100 feet around the outside of the exterior boundary of the designated use area.
- b. Within the used area and for at least 100 feet around the exterior boundary, dispose of heavy dead fuel concentrations such as logs and chunks that would cause fires to crown into green trees, or create so much heat, control would be difficult. Scattered single sound logs can, in many cases, be left with safety. (In most cases heavy fuels can be piled in safe cleared places for later use as camp fire wood.)
- c. If there is danger of a fire spreading in dry grass, needles, fern, or duff, particularly if the adjoining slope is steep at the exterior boundary, a fire line 3 to 4 feet wide should be cleared to mineral soil about 75 feet back from the exterior boundary of the used area. In all cases a fire line should be bucked through such logs as extend from the cleared area into untreated areas. Usually the fire line will only need to be constructed on the uphill or backside of forest camps.
- d. To eliminate cheatgrass in and near recreational areas, consideration should be given to planting more fire resistant grasses such as crested wheat on dry sites under 5000 feet elevation and Kentucky blue grass, slender wheatgrass, smooth brome, orchard grass, and timothy, plus crested wheat in more favorable sites. (Reference should be made to in structions on "Range Revegetation".) Flash fuels such as cheatgrass should always be removed from around fireplaces and stoves and camping spots.
- e. Eliminate low hanging limbs and all mossy limbs or witch brooms from above or close to fireplaces or stoves.

- 3. Hunter camps: (Camps used only during the hunting season)
- a. Remove fine dead and dry fuels from the used area and for at least 25 feet around the outside of the exterior boundary of the camp. Flash fuels should always be removed from around stoves and fire places.
- b. Buck a fire line through logs which extend from the treated area into untreated areas. If there is considerable dry grass, needles, or duff in the treated 25 foot strip, it will be desirable to construct a fire line 2 to 3 feet wide to mineral earth near the outside edge of the treated area.
- c. Cheatgrass should be replaced with more fire resistant grass (see 2 (d) above)
 - 4. Summer Home, Organization, Resort Areas, and Industrial Camps
- a. Eliminate all limbs particularly those with moss, and witch brooms near building chimneys or outdoor fireplaces.
- b. Dispose of fine dead and dry fuels, such as dead limbs, bark, rotten wood, and dead brush within at least a 10 to 25 foot radius of all small buildings and 50 feet of all large buildings.
- c. From the entire used area and for at least 100 feet around the exterior boundary, dispose of all heavy fuel concentrations such as several logs close together, those so located a crown fire might be started and those so located a building would be in danger (Sound material can usually be stored for utilization as fuel wood).
- d. If the site is adjacent to upper medium, high or extreme rate of spread fuels or is against a steep slope where a fire would be apt to spread rapidly, a firebreak should be cleared around that portion of the area affected. The firebreak should be at least 100 feet to the rear of the used area and be 25 to 50 feet wide, depending on the fuels and topo graphy. It should be cleared of all dry fuels, including logs chanks dead limbs, and dry brush and ferns. If the duff or grass will readily spread fire, a fire line 2 to 4 feet wide should be dug to mineral soil toward the exterior edge of the cleared firebreak.
- e. If the developed area is (or will be) extensive, such as a large summer home group, and contains considerable dead fuels on the ground or mossy timber, firebreaks at intervals of 1/4 to 1/3 mile should be con structed across the developed area. All heavy dead and dry material and dead limbs, as well as mossy limbs for a height of 8 feet, will be removed from the firebreak, which should be 100 to 200 feet in width.

- f. Cheatgrass should be replaced with more fire resistant grasses (See 2 (d) above).
- 5. Streams and lakes (heavily used by fishermen during the fire season, particularly those in drier sites:
- a. Construction of foot paths in the safest places so as to eliminate travel through areas of critical fuels.
 - b. Elimination of log jams.
- c. Elimination of accumulations of critical dry dead fuels, dead and mossy limbs, bark, rotten wood and dead brush, through which fishermen must go, particularly at the toe of slopes.
- 6. Special recreational trails, viewpoints: (Will usually be planned for as described under "Roadside Cleanup"). Special attention should be given to:
 - a. Not routing the trail through critical fuels.
 - b. Elimination of rotten wood from the tread.
- c. Disposing of all light debris created in construction or maintenance. This can often be safely scattered some distance away.
- d. Erection of benches for resting or construction of view points in the safest places. Make use of rock points, sides of stream, near springs, or other natural stopping places. Eliminate dry or dead materials, including limbs, chunks, bark, brush, rotten wood, and logs from such places, and at the same time encourage the growth of green herbaceous material. Erect small permanent rustic signs (in addition to usual posters) such as, "Enjoy Your Smoke Here; Please Extinguish Burning Material in Streams (Dirt)". Tin can receptacles attached to rest benches are a useful device. Railings are effective to prevent hikers from entering areas of critical fuels.
- 7. Towns, villages, centers of habitation (in areas of fastburning fuels in protective units or so located, a fire would suickly spread to the protective unit mostly in recent cutovers, old burns and cheatgrass areas).

Every effort should be made to accomplish necessary cleanup by the governmental unit or as a cooperative program by the inhabitants. Failing in this and the work is necessary because of the occurrence of fires and critical fuels, plans should be made to construct fire line as follows:

a. The fire line should be well to the rear of all used areas at least 200 feet; in some cases a 1/4 mile or more. The location will depend on risk, topography, and fuels select the best from the stand point of construction, maintenance and stopping a fire.

b. In heavy fuels (Slash, old cutovers, etc.) all dry and dead material in a strip 50 to 100 feet wide should be disposed of. If the duff will readily carry fire, a fire line 4 to 6 feet wide should be dug at the rear of the cleared fire line (Obtaining a dense stand of reproduction in the cleared fire line is encouraged to provide a permanent firebreak.)

- c. In light fuels (cheatgrass, etc.) two parallel fire lines, 6 to 10 feet wide, should be dug (plowed, bulldozed) to mineral soil. The lines should be 50 to 100 feet apart. The intervening space between the two lines should be burned each season as soon as the grass cures and it will burn when forced. To insure a sufficient grass cover that can be burned easily and clean, it is usually desirable to construct three parallel fire lines and then burn alternate strips every other year.
- 8. Old shacks, mining buildings, sawmills, construction camps, snow sheds, etc.: In many cases, these old deserted improvements are a real hazard. When there is no question as to retention of the old im provements by former owners (Caution Obtain permission or serve notices as to removal of hazard) they should be disposed of; usually by burning during the winter. Using explosives to blow down or loosen heavy timbers will often facilitate burning.
- 9. Burning sawdust piles and mining slag piles: The few in the Region are a constant hazard every fire season. The hazards can be abated by:
- a. In some cases explosives have been used successfully. It takes lots of explosives centered in the middle of the pile.
- b. Shoveling all material into a flume with running water is always effective and sure but costly.
- c. If an absolutely clean (so will not clog) source of gravity water is assured, an automatic sprinkling system can be installed to operate throughout the fire season.
- d. Unless every spark is extinguished, a fire line, 25 to 50 feet in width, should be cleared of all dry fuel, both large and small, around the burning pile and on the far side of the cleared circle a fire line 5 to 10 feet in width should be dug to mineral soil

Project Plans

The numerous jobs vary a great deal in size and scope and to that ex tent the project plans will vary from intensive to the most simple. Plans involving heavily-used high value recreational areas should be made in detail and with care and must be correlated with recreational unit and tract plans. Those involving such simple jobs as burning down a small old building in the winter need consist of no more than the authority to do the job. If any work is done on other than National Forest land, a permit, easement or other legal authority, must be obtained in advance of work. Project plans will be made in two parts; the map and instructions for doing the job. Each is described below; appropriate portions should be used for the particular planning job:

1. The project map: Recreational unit and tract maps or plats, right of way maps, city or county maps, and other available maps should be taken advantage of to show the work to be done. If no suitable map is avail able, one should be made on an appropriate scale. As most of the work will be confined to a rather small area, the scale will usually be large, such as 1 to 4 inches on the map equals 100 feet on the ground. For cleanup work along a stream or lake, a scale of 2 inches equals one mile may be large enough.

Maps will usually be atlas size, 18 x 21 inches. The work to be done will be shown on the map by an appropriate legend. In most cases, special instructions for doing the job or jobs can best be placed on the margin of the map.

Prints will be made of the map in sufficient copies to furnish project leaders (foreman, guard, etc.) and to place in atlasses in the Ranger and Supervisor offices.

- 2. The project instructions: They will be letter size and inserted in a suitable binder for use by project leaders. A copy of the map will be folded and also placed in the binder. The written instructions will consist of:
- a. Special instructions involving the particular job not placed on the map; include equipment needed, number of men, time and period of work, costs, transportation, housing, etc.
 - b. Instructions on "Snagfalling Methods", if involved.
- c. Instructions on "Roadside Cleanup Methods", if involved appropriate for trail, stream, lake, etc., cleanup.
- d. Instructions on "Recreational Area Cleanup Methods", and other instructions referred therein.
 - e. Instructions on "Debris Piling and Burning Methods".

Power Line Cleanup (Surveys and Plans)

Introduction

More and more power or transmission lines are being constructed into forested areas. Many miles of lines (particularly R.E.A. and P.U.D.) are on small wooden poles in narrow clearings. Power lines are causing more fires because of inadequate clearing, or poles falling over.

The prevention of power line fires is primarily the responsibility of power companies, P.U.D.'s and the R.E.A. If their lines and rights of way are not adequately maintained (good poles and necessary ground and overhead clearing), the attention of local power officials should be called to needs and recommendations made as to essential work.

-"A Guide to Hazard Reduction and Fire Prevention Measures for Power Lines" is included in this chapter, immediately following the Bibliography. This is a condensed form of a study and report prepared by Region 5 under the same title.-

Program

If power lines are not adequately maintained and the responsible parties refuse or neglect to do so, the matter should be promptly reported to the regional forester with recommendations before funds are expended for such work. Each case must be specifically approved in advance by the regional forester before any work program is initiated by the Forest Service.

Highway or Railroad Fire Lines (Surveys and Plans)

Introduction

From highways and railroads traversing inflammable fuel areas, such as grass, ferns, recent cutovers or old burns, many fires start each year. State laws are definite as to the responsibility for railroad (common carrier) right of way cleanup and for fire suppression. Performance varies considerably. State (County) Highway Department units also vary as to road side cleanup and the construction of fire lines paralleling the roadbed.

Railroads can be required to perform the cleanup required by State law or under stipulations where National Forest land is involved. They can be expected to do the essential work, but they often seek and need assis tance in planning the most desirable work and sometimes in general super vision. Some cleanup is performed by the Forest Service under cooperative agreements and deposited work funds.

Every effort should be made to get the State (County) Highway De partments and the Public Road Administration to do the necessary cleanup work including the construction of fire lines when needed. (See "Stipula tions for Clearing Projects" in this Chapter.) On National Forest lands some desirable work can be accomplished as a result of stipulations under special use permits. In specially hazardous situations extra work may be necessary. On private lands within protective units all work on the part of the Highway units must be accomplished by cooperation. Action is usually more easily obtained if a project plan, involving essential work, is coop eratively developed. If essential work in critical areas of high risk and occurrence cannot be accomplished cooperatively through the Highway units, the essential work should be independently planned and then accomplished at the first opportunity.

Planning Guides

To facilitate planning, essential cleanup work regardless of who finally performs the work, the following guide lines are pertinent:

1. Railroads:

- a. Current cleanup of all inflammable material within the right of way. (A state requirement).
- b. Falling all snags within 300 feet of the right of way. (Good practice but may be hard to obtain compliance, particularly on private lands.)

- c. Construction of a dozer (or hand in rough places) fire line on the outside edge of the right of way. A practice widely and most profitably used by railroad companies. In many cases the fire line should be constructed beyond the right of-way; particularly true in dry fuel areas above deep cuts, narrow rights-way and under bridges. If national forest lands are involved, a permit can be issued to construct the fire lines if not covered in the original stipulation. Inflammable material between the right of way and the fire line should be eliminated.
- d. The detailed project plan for essential work can be shown and described on railroad right of way plats and referenced to stations and tangents. If any question arises, the jobs can be staked on the ground.

2. Highways:

- a. In cheatgrass or other highly inflammable areas the con struction (and maintenance) of a fire line, 3 to 6 feet wide, to mineral soil, parallel to the highway is the best known cleanup device. The fire line should be not less than 6 feet from the ditch, cut or fill line and not more than 20 feet if the topography permits. Short sections may have to be constructed by hand as no blanks should be left. A V plow or light dozer will do the job. (It would be best to plow parallel fire lines and burn out the intervening strip each spring but this would leave a black scar and is therefore considered undesirable.)
- b. Debris resulting from annual maintenance should be dis posed of currently.
- c. Ditch lines should be kept well cleared of all inflammable material.
- d. The detailed plan, including description of the work, can be shown on highway and road survey maps and referenced to stations. If necessary, the planned work can be staked on the ground.
- e. In dry cheatgrass areas, it would be desirable to plant crested wheatgrass between the highway and the plowed fire line.

Roadside Cleanup (Surveys and Plans)

Introduction

Many roads have been constructed in the past within the National Forests without adequate cleanup. Many roads are to be reconstructed or are classified for betterment; in many cases roadside cleanup will be included as a part of this work. If existing instructions are followed, clearing on new roads should be adequate for most purposes. No advance roadside cleanup work should be done on any road which is to be reconstructed within the following two or three years.

Region wide there has not been a large number of fires started alongside roads. Except for unusual cases a great deal of work cannot be justified to prevent fires from starting. Roads are often used as a fire line or break in fire suppression. Where the occurrence of fires is high, cleanup can usually be justified. In surveying the roadside cleanup job and making project plans, extreme care must be given to meeting objectives and establishing priorities and to see that expenditures are justified.

Objectives

The specific reasons for roadside cleanup are often interwoven and planned work cannot be clearly classified as meeting a single objective. Usually planned work will be justified for one or more objectives. The major objectives are:

- 1. Elimination of hot-burning fuels to provide a firebreak for the control of fires.
- 2. Elimination of fuels that provide a ready place for fires to be started by travelers.
 - 3. Improvement of the appearance of roadsides.
- 4. Safety to travelers and reduction of maintenance costs (usually this will be taken care of through road betterment work if not, include in roadside cleanup plans).

Planning for cleanup work on recreational trails should be handled in the same manner as roads and to that extent the following instructions also apply.

Classification of Roads

For use in establishing priorities and for planning, roads can be grouped into a number of broad classes by a combination of use and/or fuels or cover type. Eliminating logging roads in current use or to be constructed (which are discussed under Slash Disposal in the fore part of this Chapter), roads from the standpoint of roadside cleanup are classified as follows:

- l. Roads in recreation areas: Any road within or leading to an established, regularly and heavily used area by picnic parties, fishermen, campers, hunters, summer home permittees, or resort patrons.
- 2. Forest highways: Any of the regular Federal Aid Projects across the National Forests. Usually these need little work since the Public Roads Administration administer the construction, and the State Highway Departments the maintenance, but there may be cases where snags should be felled or if felled should be cleaned up. (Also see the instructions for planning "High way or Railroad Fire Lines" in this chapter.)
- 3. Cut-over area trunk roads: Arterial roads through cutovers either recent or old, to centers where traffic flows for any reason. These roads may have had some cleanup from cooperative slash disposal funds, or by timber sale purchasers, or may have been acquired in a rather poor con dition and need additional work.
- 4. Roads in snag areas: Roads through snag patches resulting from burns or bugs. Snags may be large sized Douglas fir, moderate sized white fir or larch, even pole size as in lodge pole areas. (In many cases the snags will be felled in connection with a snagfalling project if so, the felling need not be included in roadside cleanup plans.)
- 5. High country through roads: Any road on high ridge tops or plateaus, usually above the major commercial timber zones, that connects main roads or arteries and which are apt to have more than just occasional travel by the general public.
- 6. Roads in administrative areas: Roads which will be used almost entirely for official travel for fire or other administrative use several times each year.
- 7. All other roads: Roads which have very infrequent travel, such as spur roads to abandoned mines, minor roads that are traveled only in case of fire or by hunters in the fall, or any others that would have only one or two trips over them each year.

Priorities

Priorities on each Forest will have to be established to meet the objectives. Such factors as the amount and kind of traffic, the man caused fire record, the occurrence of any fire, and the type of fuels should be given major consideration. In general priorities should be given to the following in the order listed:

- l. Fall all snags that will reach roads. (Do not include in road side cleanup plans if included as part of a snagfalling project.)
 - 2. Recreational areas or other areas of heavy use.

R-6 F. C. Hdbk. Added 9/15/45 No. 31

- 3. Cut-over areas, timber stand improvement areas, and planted areas.
- 4. Old burns, blowdowns or other areas of heavy hot-burning fuels.
- 5. Brush and grass areas.
- 6. Normal green timbered areas (usually no work required except for appearance and maintenance.)

Considering the above six classes, priorities should be given to road groups as follows:

- 1. High priority roads in:
 - a. Recreation areas
 - b. Cutover area trunks
 - c. Snag areas
- 2. Secondary priority:
 - a. Forest highways
- 3. Low priority roads in:
 - a. High country through roads
 - b. Administrative areas
 - c. All others

Width of Cleanup

Width of cleanup will vary considerably. To facilitate planning and performing the job, the following width groups are established (except all snags in reach of the road will be felled):

- Width 1. Work to depth of easy visibility with maximum of 75 to 100 feet from road edge.
- Width 2. Work to depth of easy visibility with maximum width of 40 to 60 feet from road edge.
 - Width 3. Variable width set stakes as condition warrants.
 - Width 4. Uniform width 20 feet from ditch line.
 - Width 5. Uniform width 5 feet from ditch line.

R 6 F. C. Hdbk. Added 9/15/45 No. 31 Width 6. Work only to edge of cut slope if over 10 feet or fill slope if over 15 feet. (If the cut slope is less than 10 feet or the fill slope less than 15 feet work should be extended to undisturbed ground for the equivalent distance.)

Width 7. Provide buffer zone of 25 feet beyond roadside strip in which work is tapered to natural conditions. In some cases work can also be tapered with the treated strip.

Disposal Method

Disposal methods will also vary by the fuels to be disposed of, the class of the road, and the objectives. The various possibilities are enum erated below:

- Method 1. Pile and burn on roadbed.
- Method 2. Pile and burn in openings beside road.
- Method 3. Pile at rear of cleaned strip and leave to decay.
- Method 4. Salvage all fuel wood for camp ground or work camp use.
- Method 5. Haul from area to special dump ground for burning.
- Method 6. Deck usable material for timber salvage or sell usable products.

Machine Work

When the road is examined for cleanup work and project plans are being made, consideration should be given to the use of machinery to do the work. In considering the use of machinery, it should be realized that re production, second growth, and green trees should not be damaged. This is particularly important in recreational areas and on Forest Highways. In many places machines or power driven equipment can be used to advantage. The most common equipment items to consider in plans are:

- 1. Power saws for snagfalling and bucking.
- 2. Slash-bunching teeth on angledozers (see Slash Disposal in this Chapter).
- 3. Tractors with tongs or chokers for dragging out heavy pieces with or without drums.
 - 4. "Cherry pickers" or truck or tractor mounted cranes.
 - 5. Pressure torches or flamethrowers.
 - 6. Snag pushing machine (for Ponderosa pine).

R 6 F. C. Hdbk. Added 9/15/45 No. 31

Degree of Cleanup

The degree of cleanup can best be grouped as follows:

- Cleanup 1. Fall all snags that reach the road.
- Cleanup 2. Remove all heavy (over 18" diameter) material on ground.
- Cleanup 3. Remove all dead pole size material either standing or down.
 - Cleanup 4. Remove all rotten punky material to the ground line.
 - Cleanup 5. Cut all stumps flush with the ground line.
- Cleanup 6. Cut all stumps over 10" diameter flush with ground line smaller ones may be 8" or less high.
 - Cleanup 7. Remove all dead limbs from standing trees (no green ones).
- Cleanup 8. Remove all bent and leaning green material except brush and large trees.
 - Cleanup 9. Remove all dead brush.

Summary Specifications

For clarification and for ready use by roadside cleanup "planners" the foregoing are summarized on the following page (Page I 2 49).

The Project Plan for Roadside Cleanup

Each road should be treated separately by the class of road or a logical project of a few miles. The plan should be referenced to mile posts or section lines. The plan, for later use by a project leader (foreman, etc.) will consist of two parts—the written instructions and the map.

- 1. The instructions: should consist of:
 - a. Name and brief description of project.
- b. All necessary written instructions on snagfalling methods, debris piling and burning methods, roadside cleanup methods, use of equip ment, and any other instructions on how to do the job.
- c. The specifications as to width of cleanup, disposal methods to be used, machine or equipment use and degree of cleanup for each section of the road requiring different treatment and referenced to mile posts or section lines, or to cleanup stakes (usually the planner will stake the clean up sections and exterior limits).

R 6 F. C. Hdbk. Added 9/15/45

SUPMARY OF SPECIFICATIONS FOR ROADSIDE CLEANUP (See foregoing text for descriptions and numbers of specifications)

	Major Objective		: Width of : Cleanup			: Degree of : Cleanup	: Remarks
Recreation Areas :	: : 34 :	High	: 1		: Very :	: 1 to 9 incl.	
Forest Highways	34	Secondary	: 1		: Very : Limited	: 1 to 9 incl. :	
Cutover Area Trunks:	: 1-3-4	: High	: 3-4	: 1-2-3-4-6	Helpful	: 1 to 3 incl.	
Snag Areas	: 14	: High	1-2-3-5	: 1-2-3-4-6	Helpful	: 1 to 3 incl.	:
High Country : Through Roads :	: 1-4	: I:ow	: 4		: Use : Sparingly	: 1 to 3 incl.	
Administrative Areas	: : 1 :	I.ow	: 5 : 5	: 1-2-3-4	:	: 1-2	: Check these : carefully to : see if work pays
All Others	: 1	: J;ow	: 5 :	: 3-4 :	: Will Vary	: 1-2	These roads maynot qualify forinclusion inprogran

- d. Special equipment list, if any.
- e. Necessary instructions as to number of men, transportation, camp or work bases, training, safety, and other items not otherwise adequate ly covered for the specific project in general instructions.

The written material should be bound in a suitable letter size cover. The map will also be bound, after folding, in the same cover.

2. The map, usually a suitable base map is already available, such right of way survey, road traverse, unit recreational map, special use map, maps for areas of special hazard, timber sale maps, project plan map for snagfalling, etc. The scale of the map will vary with the intensity of the work to be done. In no case should the map be less than 2 inches to the mile; in many cases it will need to be 4 or 8 inches to the mile or even larger.

As much as possible of the special specifications pertaining to the particular project should be shown on the map. It will then become a highly prized tool in the hands of the project foreman.

A sample map is shown on the following page.

Guard and Administrative Station Cleanup (Surveys and Plans)

All guard and administrative buildings should be safeguarded from fires; either from a fire starting in the building and spreading to forest fuels or from a forest (brush or grass) fire spreading to the buildings. As visibility clearing usually involves a lot of cleaning, it is included under this project.

Cleanup Standards for Use in Making Project Plans

- l. Falling of all snags and unsafe defective or leaning trees that will reach a structure, building, or lookout tower guys. Stumps will be cut low.
- 2. All inflammable debris logs, chunks, dead limbs, sticks, dead brush, and accumulations of rotten wood will be cleared, or removed, and kept cleared from an area within a 100 foot radius from all cabins, dwellings, warehouses, shops, and lookout houses and towers; and within a 10 x 25 foot radius from garages, toilets, and similar small outbuildings. (Except as necessary for visibility clearing, for safety, and for constructing improve ments, green trees and reproduction, and green brush or shrubs such as huckle berry, rhododendron and vine maple, and hardy perennial grasses should not be removed, except as may be provided for in station development plans).
- 3. Dry cheatgrass and bracken fern will be cleared from an area with in a 15 to 25 foot radius from all buildings or structures. (The planting of more hardy fire resistant grasses is encouraged.) Green herbs and brush of any species should be cleared at least two feet back from any lookout house or tower for low species and up to 10 feet back for tall species.
- 4. If there is danger of a ground fire spreading in flash fuels to or from a lookout house or tower, a fire line, at least 2 feet in width, will be dug or scraped and then maintained about 50 feet from the house or tower.
- 5. All inflammable debris created from visitility clearing, regard less of the distance from the lookout house or tower will be cleased up. In old burns, where many snags are felled, or many logs are on the ground, all heavy fuel concentrations, for at least a radius of 200 to 300 feet from look out houses or towers or guard cabins, will be disposed of.

Project Cleanup Plan

The planner will make up the project plan for use by the project leader (foreman, guard, etc.) in two parts as follows:

l. The project map: (Note The amount of visibility clearing (falling snags or trees) will be determined by one of the methods described in Section I, Chapter 4, Part II of the Fire Control Handbook.)

R 6 F. C. Hdbk. Added 9/15/45 No. 31 In many cases a site map is available for use in showing the planned cleanup work. If a suitable site map is not available, a rough sketch map, on a scale of either 2 or 3 inches to 100 feet, should be made. The location, kind and priority of the cleanup work should be shown on the map by suitable legend. Most of the special instruction for cleanup work can be fully des cribed as to kind and methods on the map margin.

The finished map with margin should be atlas size, 18 x 21 inches. It should be duplicated so copies will be available for the project leader, for use at the station, and for filing in Atlases in the Ranger and Super visor offices.

2. The project instructions: Complete instructions for the cleanup project will vary with the kind of work to be done.

Appropriate material, as follows, should be included:

- a. Instructions on "Snagfalling Methods".
- b. Instructions on "Debris Piling and Burning Methods".
- c. Instructions on "Guard and Administrative Station Cleanup Methods".
- d. Instructions specially prepared for the particular project and not included on the map such as, list of tools or equipment, size and location of piles, time for burning the piled debris, material to be salvaged or utilized, number of man days and costs.

The instructions should be on letter size paper and when completed bound together in a binder. One copy of the map should be folded and in serted in the binder.

SAMPLE COOPERATIVE AGREEMENT FOR ADDITIONAL PROTECTION INCLUDING SLASH DISPOSAL ON PRIVATE LANDS

-Act of March 3, 1925 (16 USC 572) as amended-

(Reference should be made to policies regarding cooperative	Volume 3, Section A, re agreements for pro-	Title 6, FSM, 403.4 for tection and slash disposal.)
THIS AGREEMENT made between	thisday of	, 19 , by and , hereinafter

(Name of Land Owner)

called the Cooperator and the Supervisor of the

on behalf of the Forest Service, U. S. Department of Agriculture, hereinafter

called the Forest Service, witnesseth that:

-WHEREAS, The Forest Service is authorized, under the Act of March 3, 1925 (16 U.S.C. 572) as amended, to cooperate with owners of land situated within or near a National Forest in performing protection work on such lands where the owner of the lands deposits funds to defray the cost of such work. and-

WHEREAS, the Cooperator is desirous of *-having the Forest Service provide additional fire protection, including slash disposal, on lands of the Cooperator described below:-*

NOW, THEREFORE, It is agreed as follows:

agreement and the creation of the slash.

- 1. This agreement does not relieve the Cooperator from payment of the fire patrol tax (or Association assessment) as required by State law, but is in lieu of slash disposal as required by such law.
- 2. *-The Cooperator agrees to deposit in advance, (by remittance made payable to the Treasurer of the United States and forwarded to the Regional Fiscal Agent, U. S. Forest Service, 524 Builders Exchange Bldg., Portland 4, Oregon) the sum of \$\frac{1}{2}\$, and such additional amounts as may be mutually agreed upon to cover the estimated cost of performing protection and slash disposal work described herein.-*
- 3. The Forest Service will, upon *-deposit of funds by the Cooperator as set forth above, provide, in accordance with applicable laws and desirable forest management practices .- * additional or subsequent protection and/or slash disposal on acres of land (described as follows) (Optional - Use one.) (as shown on the attached plat) and on #(other areas within the Ranger District) (Optional - Use one #(other areas within the National Forest) of three or see #(adjacent areas). below.) The Forest Service will make a reasonable effort to perform planned slash disposal work not later than the first fall season after execution of this
- 4. Construction slash, *-which is defined-* as that slash resulting from clearing of roads and campsites, will be disposed of *-by the Cooperator at his own expense and is not included in the work which the Forest Service agrees to perform hereunder.-*

- 5. This agreement does not relieve the Cooperator of the responsibility for the suppression or cost of suppression of fires starting on slash or operating areas not covered by this agreement or fires starting either on or off the area of this agreement which could have been prevented and/or which are the result of the Cooperator's operation or the Cooperator's affiliates, subsidiaries or employees. (optional in whole or in part.)
- 6. The Forest Service, in assuming additional fire protection including slash disposal on lands covered by this agreement, shall not be liable for any damage incident to cooperation hereunder, but agrees to employ every reasonable effort to reduce the possible damage by prompt and effective suppression action and other appropriate measures.
- 7. Upon completion of planned slash disposal work on any legal subdivision of 40 acres or more, and after payment has been made as provided *-under item 2 above,-* a recommendation will be made *-by the Forest Service to-* the

State Forester (in Oregon); Supervisor of Forestry (in Washington)

That

A certificate of clearance (in Washington); an unconditional release (in

be issued to the Cooperator.

Oregon)

8. After the Cooperator has been issued

A certificate of clearance (in

Washington); an unconditional release (in Oregon) for any of the lands included

in this agreement, or after the first fall burning season subsequent to cutting and logging the timber, the Government will be responsible for and take charge of the suppression of fires, at such times and in such manner as provided for in a general protection agreement, currently in effect between the Forest Service and the

(State Forester)

Fire Association for the protection of private lands), provided the Cooperator is not responsible for the starting or spread of the fire as described in item 4 of this agreement. Prior to the issuance of a

or prior to the first fall burning period, the Cooperator will be responsible for the suppression of any fire in the operating or slash area as prescribed

- for the suppression of any fire in the operating or slash area as prescribed by law.

 On The Cooperator agrees that moneys deposited under this agreement.
- 9. The Cooperator agrees that moneys deposited under this agreement shall be available to the Forest Service until expended for the purposes herein set forth, including the salaries of supervisory overhead and clerical workers and other related overhead expense.
- 10. *-The Forest Service agrees to refund the Cooperator any unused portion of funds remaining on deposit after the agreed-upon work has been completed.-*

R-6 F.C. Hdbk. Amended 11-9-53 No. 80

general benefit.	
and thereafter automatically re	State Forester (in Oregon) , or has been otherwise terminated
IN WITNESS WHEREOF,	we have executed this agreement this
day of	, 19
WITNESS:	Company
	By
	Title
WITNESS:	UNITED STATES FOREST SERVICE
	National Forest
	By
	Forest Supervisor

11. No Member of or Delegate to Congress, or Resident Commissioner,

shall be admitted to any share or part of this agreement or to any benefit that may arise therefrom, unless it be made with a corporation for its

Stipulations for Clearing Projects

Reference should be made to the National Forest Manual, NF-A2 for policies regarding instructions to be issued by Supervisors to permittees and contractors handling clearing projects on national forest lands.

Projects

The following sample stipulations are intended as guides for the preparation of instructions and stipulations. What measures are necessary and the exact wording will have to be decided by the Supervisor in each individual case, as permits and conditions will vary in different localities and for different projects.

SAMPLE GENERAL STIPULATIONS FOR CLEARING PROJECTS

- 1. The permittee (or contractor) shall have on the ground a representative who shall be authorized to receive and carry out on behalf of the permittee (or contractor) any and all notices or instructions by the forest officer in charge in regard to burning and fire precautions.
- 2. The Forest Service will employ a man whose sole duty it will be to supervise the burning and precautions against the escape of fire, and who will work under the direction of the Forest Supervisor. The permittee, when called upon by the Forest Supervisor, shall deposit in the Cooperative Work Fund the amount necessary to pay this forest officer's salary and expenses. (For P.R.A. and possibly other Federal projects, ömit last sentence.)
- 3. At all times when burning is in progress the permittee (or contractor) shall have on the project a sufficient number of men to keep the fires under control. The size of this crew and its personnel shall be subject to the approval of the forest officer.
- 4. The permittee (or contractor) shall have on the job sealed tool boxes marked "For Fire Only." The location of these boxes will be specified by the forest officer. Each box shall contain the following equipment, suitable for fire fighting and maintained in serviceable condition: (Note Adjust list of tools as necessary to fit local condition.)

	Number					
<u> Item</u>	East Side	West Side				
Axes, double-bitted Waterbags, 2½-gallon	3 2	3				
Large pails Back-pack pumps with 5-gallon		6				
metal container (to be kept		tra, ministra				
full of water)	1	1				
Files, 7"	2	2				
1-2-57						

1-2-24 I-2-24

	Number				
Item	East Side	West Side			
Files, 10"	4	4			
Handles, saw	2	2			
Hazel hoes or Pulaskies	6	6			
Road rakes	3				
Falling Saws	1	1			
Shovels, long-handled, round-pointed	6	6			
Sledges	1	1			
Wedges	2	2			

- 5. The permittee (or contractor) shall have on the project a portable power pump, satisfactory to the forest officer, at least 1500 feet of $1\frac{1}{2}$ -inch hose with 3/8-inch nozzle, and tools and accessories necessary to operate the pump efficiently. The pump must be capable of delivering at least 25 gallons per minute through 1500 feet of $1\frac{1}{2}$ -inch hose with a 3/8-inch nozzle at an elevation of 300 feet above the pump. This equipment shall be maintained in readiness for immediate use and shall be tested at such times as may be required by the forest officer. (Change figures as necessary to fit local conditions.)
- 6. The permittee (or contractor) shall provide an acceptable truck with water tank of not less than 300 gallons capacity, which shall be kept filled with water, at a point on the project designated by the forest officer. This truck shall be equipped with a satisfactory water pump, at least 600 feet of 1- or $1\frac{1}{2}$ -inch hose and other necessary accessories as called for by the forest officer. During possible dangerous fire weather a truck driver will be kept available to operate the tanker unit at all times.
- 7. (West Side) A two-inch pipe line shall be so placed as to serve all portions of the area being burned, if called for by the Forest Supervisor. The pipe line shall furnish sufficient water to supply the portable gasoline pump at full capacity. Outlets for $l\frac{1}{2}$ -inch hose shall be provided at intervals of 400 feet, and also a tank or barrel for transfer of water to the portable pump. If the pipe line cannot be served by gravity, a stationary engine will be used for pumping.
- 8. Each tractor, truck, or other internal-combustion engine shall be satisfactorily equipped with one or more chemical fire extinguishers with a total minimum capacity of two quarts, one round-pointed, long-handled shovel and one double-bitted axe; these articles to be so placed on the tractor, truck, or power shovel that they can readily be reached from the ground. Extinguishers shall be kept filled and ready for use. (Two 1- or 1½-quart extinguishers may be substituted for the 2-quart extinguisher.)
- 9. During the closed season as defined in State laws, designated internal-combustion engines, including tractors, shall be provided with adequate spark arresters, acceptable to the forest officer. Trucks operating on the project

shall be equipped with mufflers or spark-arresting devices satisfactory to the forest officer. All steam engines operated with the exhaust inside the stack or with any other form of forced draft shall be equipped with adequate spark arresters acceptable to the forest officer. All steam engines shall be equipped with tight ash pans. If in the judgment of the forest supervisor the fire danger demands it, the period during which this equipment shall be provided may be extended. Watchmen around stationary engines will be furnished by the contractor (or permittee) at such times and places as specified by the forest officer.

- 10. (East Side) Unless a narrower width is specified by the forest supervisor, the permittee (or contractor) shall clear and keep clear of all inflammable material a strip of land ______ feet in width, being _____ feet on each side of the center line of the road (or right-of-way), and unless considered unnecessary by the forest supervisor, shall cut all snags and dead trees over 15 feet in height for a distance of ______ feet on each side of the center line of the road (or right-of-way). The term "inflammable material" is to be interpreted as including besides slash, brush and limbs and tops of felled timber, all logs and rotten wood. All timber must be felled parallel with the road (or right-of-way). Trees which by accident or otherwise fall outside of the road (or right-of-way) must be lopped and all logs and brush must be drawn into the road (or right-of-way) for removal or burning.
- ll. (East Side) All logs, limbs, slash, and other debris to be burned shall be piled in the right-of-way as directed by the forest officer. Piles shall be as small as practicable and not over 15 feet in diameter. On level ground piles shall be located about the center line, as far as practicable from uncut timber, and on slopes piles shall be located below the center line.

(West Side) All slash and debris shall be either scattered or piled and burned, or both methods shall be employed, as determined by the forest officer. Where slash and debris are scattered, they shall be spread in such manner as to lie away from living trees. Piling shall be done in accordance with instructions of the forest officer, and piles shall be so placed that they can be burned with the least possible damage to standing trees and young growth. All scorched trees shall be cut and disposed of if required by the forest officer.

- 12. (East Side) Before any burning is undertaken, during dangerous fire weather as determined by the forest officer, the area to be burned shall be divided into units and fire lines constructed entirely around each unit. Fire lines shall be cleared to mineral soil. The size of each burning unit will be determined in advance by the forest officer and will depend on topography, volume of material to be burned, number of piles, and the general fire hazard in the surrounding territory.
- 13. Slash disposal shall be completed insofar as practicable during the late fall and winter. No burning shall be done during the closed season or during such other periods as determined by the forest officer, without a written permit from the forest officer.

1-2-59 I-2-26 In the dry season, burning will ordinarily be done between 7 p.m. and 7 a.m. of the following day. The forest officer will stipulate the hours during which burning may be done and the hour when all fires must be extinguished. Burning on one unit shall be completed and all fire extinguished to the satisfaction of the forest officer before any burning is started on another unit.

14. (East Side) During periods of exceptional fire danger, as determined by the forest officer, the permittee (or contractor) shall extinguish all fires on the right-of-way and shall employ such patrolmen or watchmen as the forest officer may require, and it shall be the sole duty of such patrolmen or watchmen to patrol the burned area and watch for fire at all times until the critical period has passed.

(West Side) The forest officer will stipulate the size of the unit to be burned at one time and the hours during which the fire may be allowed to burn. Burning on one unit shall be completed and all fires extinguished to the satisfaction of the forest officer before burning is started on another unit. In the discretion of the forest officer, patrolmen or watchmen may be required during dangerous fire weather until danger of hold-over fires is past.

- 15. The forest officer shall be notified at once of the escape of fire and he may, in his discretion, take charge of fire control work. The permittee (or contractor) shall place at the disposal of the forest officer such men, tools, and equipment as the forest officer may consider necessary to extinguish the fire in the shortest possible time. Such action shall not minimize the liability of the permittee (or contractor) for damages and cost of controlling the fire.
- 16. Employees of the contractors and sub-contractors will be prohibited from smoking within the clearing operation at such times as the forest officer may deem necessary as a precautionary measure.
- 17. Clearing on steep side hills where fire hazard is great will call for the presence of an extra alert fire squad of not to exceed ______ men to be furnished by the contractor or sub-contractor, as required by the forest officer on duty.
- 18. The contractors or sub-contractors will keep all roads crossing or running through the area in a passable condition and will repair all damage to such roads to the satisfaction of the Forest Supervisor. During periods of emergency the road will be immediately cleared of debris or other blocades at the request of the forest officer.
- 19. The term "forest officer" wherever used in these stipulations signifies the officer or employee of the Forest Service who shall be designated by the forest supervisor to supervise burning and fire precautions in the operation covered by these stipulations.

I-2-60

20. These stipulations apply to all intermingled private, state, or county lands, used by the permittee (or contractor) in his operation within the national forest boundaries or within one mile thereof. The operation is also subject to all state and federal fire laws relating to fire precautions and the disposal of slash and debris.

In addition to the general stipulations numbered 1 to 20 which can be used for various clearing projects, the following modified stipulations will be used as standard clauses for all clearing projects involving state and forest highways, and if deemed advisable by the Forest Supervisor, may be applied to county roads or private roads. The clauses, with necessary rewording or expansion, will be incorporated in stipulations issued by the Forest Supervisor rather than in special use permits. If the Forest Supervisor feels that conditions on the ground require additional clearing measures, he should take the matter up with the local state highway or county representatives well in advance before bids for construction are solicited. The stipulations, numbers 21 to 23, follow:

21. In Green Timber: The permittee and/or contractor, in a manner satisfactory to the forest officer in charge, will dispose of all debris and inflammable material, which means all slash, limbs, tops of felled trees, logs, brush, stumps, and rotten wood within the construction area. The construction area is defined as that area required for the excavations and embankments for the road or highway, or that area specifically so denoted to be cleared by clearing limit lines on the construction plans for the project. None of the debris resulting from the area cleared shall be left upon lands outside or adjoining.

All snags and dead trees 15 feet in height shall be cut and felled on each side of the road or highway for a distance of 200 feet from the center 'line of the road or highway, measured along the slope at right angles to the center line. Dead trees and snags shall be felled so as to lie on the ground, and under no circumstances to be left lodged or leaning against other trees. They shall be cut at a height above the ground not to exceed the diameter of the trunk at the place of cutting, or lower.

- 22. In Old Burns: Where the highway or road traverses an old burn or other specially hazardous area, the same clause as number 21 will apply, but in addition a further stipulation may be made requiring a fire line to be constructed in the strip of felled snags or other hazardous area about 200 feet from the road or highway. The fire line to consist of clearing an opening by bucking the logs or snags to provide a way or trail of about 20 feet in width through the strip.
- 23. On the East Side, in the pine country, the same clause as number 21 will apply, but in addition a further stipulation may be made requiring the removal and disposal by burning or other method satisfactory to the Forest Supervisor of all inflammable material consisting of limbs, tops of felled timber, logs and rotten wood from a strip extending for a distance of 25 feet on each side of the construction area.

STIPULATIONS FOR FIRE PROTECTION FROM SAWMILL RISKS

(For use in connection with Special Use Permits, Timber Sale Contracts and Land Exchange Agreements)

Size and Location of Mill Site

The mill site shall be large enough to provide ample room for buildings, mill pond or log storage, lumber yard, slab and fuel storage.

1. The areas shall be cleared of all timber and brush and kept cleared for a distance of 100 feet beyond the exterior limits of mill, lumber yards, and other areas used in the milling operation.

A fire line 10 feet wide to mineral earth shall be constructed and currently maintained at the edge of the cleared area except that natural barriers (lake, stream, water, or road) may be substituted for constructed fire line at the option of the Forest Officer in charge.

2. The mill, lumber, and log storage yard shall be located in a natural opening (meadow, sagebrush flat) not closer than 1/8 mile to forest land.

Snagfalling

All snags over 15 feet in height shall be felled for a distance of 200 feet beyond the exterior edge of the mill site clearing when required by the Forest Officer in charge.

Fire Fighting Tools

During the fire season as prescribed by the Forest Officer in charge, the permittee (purchaser) shall provide and maintain sufficient fire fighting tools to equip the entire mill crew for fire fighting. Tools to consist of shovels, hazel hoes, pulaskis, axes, water buckets, pump cans, falling outfits and such other tools as may be specified by the Forest Officer in charge. Tools shall be kept in a sealed box and used only for fire suppression, and shall be satisfactory to the Forest Officer in charge.

Refuse Disposal

All un-utilized mill debris (edgings, sawdust, slabs) shall be currently disposed of by burning.

*-Refuse Burner

All refuse burners located on national forest land will be of the enclosed type. General guides for determining size of refuse burners based on sawmill capacity are as follows:

> R-6 F. C. Hdbk. *Amended 6-24-52 No. 70

BIBLIOGRAPHY

(Reference Material for Hazard Reduction)

<u>Douglas-fir</u> (West Side Forest Officers should have these available for reference)

1. Slash Disposal and Forest Management After Clear Cutting in the Douglas-fir Region

Thornton T. Munger and Donald N. Matthews

U.S. Dept. of Agri. Circular 586, January 1941

2. Reproductive Habits of Douglas-fir Leo A. Isaac, PNWF&RES Printed by: Charles Lathrop Pack Forestry Foundation 1943

3. Factors Affecting Establishment of Douglas-fir Seedlings
Leo A. Isaac, PNWF&RES
U.S. Dept. of Agri. Bul., Circular 486, October 1938

4. Timber Growing and Logging Practice in the Douglas-fir Region
Thornton T. Munger
U.S. Dept. of Agr. Bul. 1493, June 1927

5. Forest Practices in Oregon (For Oregon Forest Officers only)
W. F. McCullock, Oregon State Board of Forestry
Bulletin No. 7, June 1943

6. Slash Burning in Western Oregon (For Western Oregon Forest Officers only)
Russell and McCullock, Oregon State Board of Forestry
Bulletin No. 10, April 1944

Ponderosa Pine (East Side Forest Officers should have these available for reference)

7. Slash Disposal in the Western Yellow Pine Forests of Oregon and Washington

Thornton T. Munger and R. H. Westveld U.S. Dept. of Agr. Bul. 259, September 1931

8. Timber Growing and Logging Practice in Ponderosa Pine in the Northwest

R. H. Weidman NRMF&RES
U.S. Dept. of Agr. Bul. 511, June 1936

- 9. Burning Ponderosa Pine Snags By the Base-Fire Method
 Ernest L. Kolbe, PNWF&RES
 Reprint from Journal of Forestry, November 1939
- 10. See 5 above under Douglas-fir.

Capacity Per 8-Hour Shift

Size of Burner

10,000 bd. ft.

Approx. 25 ft. dia. and 25-30 ft. high provided refuse is not longer than 3 ft.

25,000 bd. ft.

Approx. 33 ft. dia. and 25-30 ft. high

40,000 bd. ft.

Approx. 39 ft. dia. and 25-30 ft. high

Water shall be piped to the top of the burner for use in controlling sparks.-*

Mill Roof

The roof of the mill and adjoining buildings shall be of corrugated iron or similar metal. Permanent ladders will be placed on all roofs so any portion may be easily reached. Fire ladders, of sufficient length to reach the roof, will be available on each side of all buildings.

Stationary Steam Engine

Required during closed season when operating within 1/8 mile of any forest land:

- 1. The boiler or boilers shall be housed in a special building and located a minimum distance of 10 feet from the mill building.
- 2. The smoke stack shall be minimum length of ___feet (70 feet for small mills, 20 M capacity, and proportionately higher for larger mills). The smoke stack shall be equipped with a spark arrester of 3 mesh to the inch, ll-gauge black wire or equal, screen which shall be kept in constant repair.
- 3. The ash pan shall be adequate to prevent the escape of fire and satisfactory to the Forest Officer in charge.
- 4. An efficient steam pump or gravity water system, 500 feet of hose, l-inch or larger, and equipped with nozzle not less than 1/4-inch diameter shall be provided. Steam pump or gravity water system shall be of sufficient capacity to give a discharge on level ground of 10 gallons or more of water per minute through 500 feet of hose and 1/4-inch size nozzle.

Gasoline or Diesel Engines

Required during closed seasons when operating within 1/8-mile of forest land:

- 1. Spark arrester kept in constant use and repair.
- 2. Fuel tanks shall be located a minimum distance of 50 feet from the mill and placed high enough to provide for a gravity flow to the engine.

Fire Extinguishers

Fire extinguishers of the carbon-tetrachloride type shall be located at strategic places throughout the mill, particularly at the power plant and oil station, satisfactory to the Forest Officer in charge. A sufficient quantity of tetrachloride fluid shall be immediately available to fully replace the contents of all extinguishers. The carbon-tetrachloride fluid shall be of a type approved by the fire underwriters. Tests of each extinguisher shall be made at least once each year.

Water Supply

A gravity water supply will be available at the mill site. Standpipes, with 500 feet of hose not less than 1-inch in diameter, and a 1/4-inch nozzle in a shelter will be placed at 2 (3 or 4) selected spots and used for fire fighting only. The water supply will be sufficient to supply 10 gallons per minute through 500 feet of hose and a 1/4-inch nozzle on the level. The water supply system will be satisfactory to the Forest Officer in charge.

Smoking

Safe smoking places will be designated and posted in mill and yard. Employees will be permitted to smoke only at safe smoking places.

Sand Barrels

Sand barrels will be located at strategic places throughout the mill, and particularly at the power plant (boiler room, gas or diesel engine).

Covered Metal Containers (garbage cans, metal barrels)

For disposal of oily rags and waste will be provided and maintained at oiling stations.

Watchman

Competent watchman service will be provided after the mill shuts down each day, and be available at all times while the mill is not being fully operated. This service will consist of watchman with punch clock system. Punch clocks will be located at strategic points in the mill yard and near the refuse burner.

Weather Instruments

Weather instruments will be required during the closed season as follows:

Weather instruments to determine humidity, temperature, and direction of wind, satisfactory to the Forest Officer in charge.

R-6 F.C. Hdbk. Added 2/19/46 No. 32

Shutdowns

Operator (or permittee) will be required to close down when fire conditions are critical, as determined by the Forest Officer in charge.

Bond

	Purchaser	(or	permittee) W	ill	be	requi	ired	to	furnish	bon	d in	the	sum
of		to	guarantee	the	ren	nova	lof	all	bui	ildings	and	clear	nup o	of
	on the are													
termina	ation of th	nis	agreement	(pe	rmit	5).								

Fire Plan and Drill

The purchaser (or permittee) will be required to prepare a fire suppression plan for the mill and adjacent area. The plan will be satisfactory to the Forest Officer in charge and be posted for the attention of all employees. Monthly during the fire season fire drills, involving all employees and use of equipment will be held.

BIBLIOGRAPHY

(Reference Material for Hazard Reduction)

<u>Douglas-fir</u> (West Side Forest Officers should have these available for reference)

1. Slash Disposal and Forest Management After Clear Cutting in the Douglas-fir Region

Thornton T. Munger and Donald N. Matthews U.S. Dept. of Agri. Circular 586, January 1941

- 2. Reproductive Habits of Douglas-fir
 Leo A. Isaac, PNWF&RES
 Printed by: Charles Lathrop Pack Forestry Foundation 1943
- 3. Factors Affecting Establishment of Douglas-fir Seedlings
 Leo A. Isaac, PNWF&RES
 U. S. Dept. of Agri. Bul., Circular 486, October 1938
- 4. Timber Browing and Logging Practice in the Douglas-fir Region Thornton T. Munger
 U.S. Dept. of Agr. Bul. 1943, June 1927
- 5. Forest Practices in Oregon (For Oregon Forest Officers only)
 W. F. McCulloch, Oregon State Board of Forestry
 Bulletin No. 7, June 1943
- 6. Slash Burning in Western Oregon (For Western Oregon Forest Officers only)
 Russell and McCulloch, Oregon State Board of Forestry
 Bulletin No. 10, April 1944
- *-7. Broadcast Slash Burning After a Rain by Robert Aufderheide and William G. Morris-*
- <u>Ponderosa Pine</u> (East Side Forest Officers should have these available for reference)
 - 1. Slash Disposal in the Western Yellow Pine Forests of Oregon and Washington

 Thornton T. Munger and R. H. Westveld

 U.S. Dept. of Agr. Bul. 259, September 1931
 - 2. Timber Growing and Logging Practice in Ponderosa Pine in the Northwest

R. H. Weidman NRMF&RES U.S. Dept. of Agr. Bul. 511, June 1936

- 3. Burning Ponderosa Pine Snags By the Base-Fire Method
 Ernest L. Kolbe, PNWF&RES
 Reprint from Journal of Forestry, November 1939
- 4. See 5 above under Douglas-fir.

A Guide to Hazard Reduction and Fire Prevention Measures For Power Lines

Introduction

The policies, principles and instructions set up in the following guide are established to obtain uniformity in the fire-prevention measures which forest officers on various units may require of power companies.

The photographs included in the guide show representative examples of (1) satisfactory conditions for given cover types, quantity or arrangement of down fuels, power structures and topography where applicable, or (2) unsatisfactory conditions with suggested remedial measures.

Authori ty

The authority of the Forest Service to require hazard reduction, trimming, clearing, snag falling or other fire-prevention measures comes from stipulations in the permit or license covering the project under consideration.

The clauses are considered sufficiently broad to implement fire-prevention requirements. Any elaboration of these clauses or addition of supplemental fire-prevention clauses that a forest may feel are necessary for new permits they may wish to issue should be cleared with the regional forester before using them. See the Manual, NF-F, for stipulations other than for fire prevention, which are a part of all permits.

The authority of forest officers to require hazard reduction and clearing work applies <u>only</u> to those portions of the power lines which are on national forest lands. However, by personal contact with power company representatives, forest officers will in most instances find it possible to convince them that it is good business to do work on private lands similar to that done on adjacent comparable national forest lands. Necessity for remedy of dangerous conditions on private lands which present a direct threat to national forest lands may be emphasized by calling attention to the following facts.

Fire prevention and clearing conditions and requirements in permits and licenses or easements for power lines are listed in the Manual as follows:

NF-F2-3 Page (9) Paragraphs (D) and (E) NF-F2-4 Page (17) Articles 17 and 18

NF-F3-1 Page (16a)Articles 9, 10, 11 and 12

The wording varies slightly between permits, licenses, and easements, but the intent is the same. These references apply only to fire prevention. Refer to the Manual, NF-F, for stipulations other than for fire prevention, which are a part of all permits. The following conditions in the permit are quoted below to show the requirements:

- 1. The company will be held liable for suppression costs and damage to national forest lands if a fire starts from power line activity on adjacent private lands and spreads to or threatens national forest lands.
- 2. The standard stipulation requires the permittee, etc., to do everything reasonably within his power to <u>prevent</u> and suppress fires on or <u>near</u> the lands to be occupied under permit.

Naturally state laws and local county ordinances covering smoking, welding, brush burning, blasting, camp fires, spark arresters on automotive or steam equipment, fire tools, etc., apply to actions of power company employees on private lands as well as on national forest lands.

Existing Lines

Purpose of Hazard Reduction, Clearing, Trimming, etc.

- 1. The Forest Service requires power line fire-prevention measures:
 - a. To prevent fires from starting on the right-of-way from the power line or activity of workers on the power line.
 - b. To prevent damage to national forest resources and resulting suppression costs.
 - c. To reduce unusual concentrations of slash, debris or logs so that suppression forces may have a reasonable chance of constructing and holding control lines if a fire does start or to prevent flash-overs which sometimes cause fires at a distance from the location of the intense heat and smoke.

The work required of power companies by forest officers should be restricted to that needed to meet the above objectives. Clearing of <u>all</u> growth between poles or towers or for the full width of the right-of-way should not be required of the company just because the permit may say "clear and keep clear". Such clearing does not insure against fire starts since when conductors break it is usually during high winds. In the majority of cases the broken wire may be expected to fall outside of any clearing provided. One hundred percent clearing often results in the establishment of more inflammable or flash-type fuels (such as grass) than would have existed if left alone. Full clearing also opens up areas to other forms of human use with the possibility of other kinds of man-caused fires.

Similarly it is not considered necessary, from the Forest Service point of view, to require clearing to mineral soil around each pole or tower. The low probability of a fire starting at any specific pole indicates that to clear around every pole is not a reasonable requirement. Furthermore, if physical condition of the structures, cross arms, etc., is kept up to standard, the probability is still further reduced. Pole or tower clearing, therefore, should be limited to those at which power company employees are likely to work most frequently, such as switch poles, fuse poles, transformer poles, lightning-arrester poles, line junctions, and dead-end or corner poles. The primary purpose of such clearing is to prevent fires from smoking, soldering, welding, and lunch fires by company employees. In the case of transformers and fuses, the possibility of burning oil or molten metal starting a fire is also a consideration.

One hundred percent clearing between poles and around each pole adds up to a very costly job. It is considered better business to have the company use the funds and time, that would be required for such full clearing, for hazard reduction and other fire-prevention measures in locations that will give us greater insurance against fire starts or hot fires.

This does not obviate the need for removal of trees, shrubs or other growth which in time will grow to sufficient height to contact the conductors or permit arcing. Removal of snags, forked trees, leaning trees, weakened or rotten trees, those with cat faces, spike tops, etc., is also an essential measure. All these measures will be covered in subsequent paragraphs and by photographs and their captions.

On the other hand forest officers should limit the clearing in timber-producing areas to that necessary for fire-prevention purposes and to fully justified needs of the company for protection of its structures and for construction, operation, and maintenance of the line. The Forest Service should hold to the practicable minimum the land which is taken out of timber production by power-line use. The possibility of erosion and consequent damage to streams, improvements, roads, agricultural land below, etc., should also be taken into account in limiting removal of cover in erosible soils on slopes.

- 2. The Power Company clears the right-of-way, or around poles and towers:
 - a. To provide safe power transmission.
 - b. To meet the permit or license stipulations relative to fire prevention and control.
 - c. To prevent damage to power-line facilities or structures and to prevent costly interruption of service from fires.
 - (1) Starting on the right-of-way.
 - (2) Starting off the right-of-way and spreading to the right-of-way.

d. To avoid damage suits. As indicated by the above, a power company may clear the full width or length of portions of its right-of-way or around all towers for its own protection, but for forest protection should be required by forest officers to perform only the work to meet the objectives listed in section numbered "l-a" (Forest Service) above.

A power company should be required to justify fully extra width it may wish to clear for its own purposes in productive timbered areas, if that width exceeds the minimum determined by the forest supervisor to be necessary for fire-prevention purposes. The same applies to extra clearing on slopes with erosible soils.

Hazards on or adjacent to the right-of-way

- 1. Hazards that may contact the line from the sides or may fall on the line:
 - a. Forked trees; dead trees; old decadent or rotten trees; those weakened by cat faces, decay or disease; tall timber pole size trees exposed by clearing or cutting in dense stands; and trees leaning toward the line.
 - b. Branches or limbs of growth which overhang the line, in contact or near contact with the line, or which may make contact where the line or growth is swayed by heavy winds.
 - c. Branches, limbs, shoots, etc., which with added growth of several seasons will contact the line or will be within a distance of 4 feet for 12 K.V. lines or equal to the distance between the conductors of the line for other higher voltage lines.

Remedy: Fall, cut or trim all of the hazards listed above.

d. Falling of timber in connection with logging operations presents a definite hazard. Careless falling often results in trees hitting and breaking the line, causing a fire.

Remedy: Contact of operators and fallers by Forest Service and company officers urging extreme care in controlling the direction of fall of the tree. Have company fallers notify power company and Forest Service when falling in the vicinity of a power line is about to begin.

- 2. Hazards that may make contact with the line from beneath:
 - a. Tips, shoots or limbs of conifers, hard woods or shrubs which are now closer, or with one to two measons' added growth will be closer, to the line than the distance between the conductors of the line under consideration, or 4 feet for 12 K.V. lines.

b. Trees, shrubs or tall weeds on ridges between spans where clearance at present, or when taking into account added growth of several seasons or sag of the line, will reduce clearance below the distance between the conductors of the line under consideration, or 4 feet for 12 K.V. lines.

Remedy: Fall or cut such growth. Schedule this clearing so it will be done while the growth is still small and will not entail a major falling and slash disposal job. Scattering of moderate amounts of small trees and slash permitted instead of piling and burning.

3. Hazards (vegetation or fuel of any kind) around poles or towers having on them switches, transformers, fuses, dead ends, take-off lines, line junctions, telephones, lightning arresters, etc., where men work often.

Remedy: Remove annuals, brush and other growth for a radius of ten feet from the base of such poles. Purpose is to prevent fires from carelessness in smoking, welding, soldering or lunch and camp fires and, in the case of transformer, fuses, or lightning arresters, to minimize chance of burning oil or molten metal from starting fires.

Note: No clearing required around other poles or towers except in unusual instances.

- 4. Hazards from vegetation around switch yards and transformer yards (See Photo No. 38).
 - a. Clear vegetation to mineral soil from the entire switch yard.
 - b. Do such additional clearing as is necessary to produce a cleared radius of ten feet around any poles, towers or structures, located on the edge of the yard, either within or 10 feet without.

 $\underline{\text{Note}}$: Use of borates or arsenic trioxide to sterilize the soil will obviate annual clearing in the above situations.

Hazards around power houses, company residences, line cabins, latrines, storehouses, garages or similar buildings, debris or garbage dumps, incinerators

Such hazards consist of annual growth of grass or weeds, needles, duff, rotten wood, logs, stumps, brush and timber growth, rubbish, discarded clear glass bottles, etc.

Remedy: Clear to a reasonable safe distance around such structures or locations, dispose of debris and rubbish by safe methods and in safe places, limit burning to safe periods. Radius of clearing will depend on type of vegetation and topography. Establish and fire-proof dump grounds.

Mechanical defects of the power line

The power company will be better qualified to recognize certain types of mechanical weakness or defects but forest officers can readily identify some defects. All defects should be identified in collaboration with the power company representative during the joint Forest Service-company inspections.

Mechanical defects include:

- 1. Decayed, shattered, broken or loose poles and stubs or cross arms.
- 2. Loose stub bands or bolts.
- 3. Loose cross-arm braces.
- 4. Loose bolts or missing nuts anywhere on pole or tower.
- 5. Loose insulator pins.
- 6. Leaky insulators.
- 7. Broken or loose-line ties at insulator.
- 8. Cracked or broken insulators.
- 9. Loose or broken-guy wires or dead-end insulators on guys.
- 10. Buckled members of towers.
- ll. Excessive slack or sag in conductors, particularly when spans cross a ridge between towers.

Remedy: Have company repair or replace to remedy defect.

Fire-prevention practices by company employees

The fire-prevention measures applicable to anyone are also applicable to power company, and forest officers should educate them in safe practices. These include:

- 1. Observation of safe smoking rules.
- 2. Care with lunch fires.
- 3. Care with debris or slash burning. Control by burning permits.
- 4. Care with blasting, welding, and soldering.
- 5. Care in storage of inflammables or explosives.

- 6. Use of spark arresters on trucks, tractors, pump engines and other internal-combustion equipment.
- 7. Install and maintain spark arresters on stove pipes and chimneys.
- 8. Safeguarding dumps.
- 9. Avoid dumping ashes while hot and have a safe place for dumping them.
- 10. Provide spark-proof incinerators, well cleared around.
- 11. Other fire-prevention measures applicable to special situations.

Other important considerations

Separation of Heavy Fuels: Crisscross of logs or stems (heavy fuels) should be separated to prevent intense heat interfering with fire fighting on or near the fire or causing power flash-overs. Intense heat and smoke can cause power flash-overs which result in fires being set at other points along the power line.

Periodic clearing

Cutting of conifer reproduction, hard woods or tall growing shrubs which would eventually grow up and contact the conductors should be done while the growth is still small. This will obviate the need for a major "logging" and slash-disposal job since small stems are easily and quickly cut and the resulting slash may be scattered.

It is unnecessary to go to the expense of clearing low growing brush or shrubs that would never grow high enough to exceed the minimum clearance requirement.

Ingress and Egress to poles

Where cover necessitates, it is desirable to have paths cleared to each pole to permit easy ingress or egress for purposes of inspection or maintenance. This will seldom present a problem because the company will almost universally provide access to their poles as a matter of course for maintenance purposes.

It is not necessary to require paths to be cleared along the spans. Although here also the company may, where topography permits, provide "ways" passable to pickups or similar vehicles.

Sag or slack

The extra sag caused by high summer temperatures is not of major importance from a fire-prevention standpoint, since maximum allowable sag permitted in construction has been calculated for in the original design of the line.

New Construction

The principles of clearing given under "Existing lines" above apply also to new construction, with the following exceptions:

- 1. In cover types where clearing results in large amounts of slash (branches, limbs, brush, etc.), piling and burning will be necessary.
- 2. Decking and burning of logs is not required. However, these heavy fuels should be separated so that intense heat will not be generated if a fire starts or burns onto the right-of-way. Intense heat can interfere with fire fighting or cause power flash-overs at other points on the line.

If the density of cover type produces such a volume of logs and stems that they can not be separated sufficiently to prevent development of intense heat, if they should catch on fire, a sufficient number should be decked and burned to provide adequate separation of the remainder.

If the material is not salvaged by the company and removed from the area within a reasonable period, the material considered for burning should be burned.

Forest officers should urge power companies to dispose of felled material for sawlogs or fuel to the maximum practicable extent.

In construction work the width of clearing should be limited to that really necessary for reasonable ease of construction of the line and to obtain minimum-clearance requirements for prevention of fires starting, to hold to a minimum the area taken out of timber production or to maintain scenic and aesthetic values.

Self-supporting aerial cable

No clearing to obtain side or vertical clearance is required when self-supporting aerial cable is used, except for removal of snags, forked trees, leaning trees, etc., which might fall across the cable and break it. This type of cable is being tried out on an experimental basis in a few locations for distribution lines. However, it is rather costly and its adoption for distribution lines will probably proceed slowly. The cable is entirely insulated and presents no danger of starting fires from contact with branches, etc.

It is necessary with cable, of course, to clear around transformer, switch and fuse locations on the ground and to prevent contact of vegetation at line level.

PHOTO INDEX

	Page No.
Width of Clearing	I-2-76 to 79
Side Clearing	I-2-80 to 82
Clearing Beneath the Line	I-2-83 to 85
Separation of Heavy Fuels	I-2-84 to 85
Clearing Around Poles or Towers	I-2-86 to 89
Special Structural Measures - Bird Guards	I-2- 90
Canaral	T-2-01

R-6 Inspection Outline - Airplanes, Pilots, Airports

Reports and Records

Form R6-F23 - Airplane operation report: For completeness of information and mailing schedule.

Form 100-R6 - Daily aircraft flight report: For information given and mailing schedule.

Form R6-F17 - Flight plans: For route properly described. Log books - current and in proper condition. CAA safety bulletins - read and filed.

Airplane

General condition - clean (Consideration given due to airport surface, etc.).

Amount of gasoline in tanks.

Amount of oil in motor or oil tank.

Tires - pressure and condition.

Propeller - pits and smooth operation.

Gasoline gauges - condition and proper functioning.

fabric - holes, tears, worn places, etc.

Control surfaces - free movement, condition of hinges and fittings.

Motor compartment - excessive oil accumulation.

Windshield - clean and not scratched. Cabin

Clean.

No smoking sign - posted.

Seat hold-down studs - removed.

Static cable - proper tension.

Drop-port door and safety bar - in good condition.

Radio head sets and microphones - on hangars.

First aid kit - complete.

Fire extinguishers - filled and working properly.

Message droppers - number and location.

Parachutes - packing dates.

Battery - charge and water level.

Radio - functioning properly.

Baggage compartment

Motor tools - carried.

Emergency tools - in place:

Emergency rations - 2 days' complete.

Pilots

Servicing procedure - recommended fire precautions observed. Engine starting and warm-up.

Taxiing.

Take-off.

Manifold pressure used.

R.P.M. used.

Use of throttle and controls.

Use of mixture control.

R-6 F. C. Hdbk. Issued 6-18-48

No. 45

III-6-11

Pilots (Continued)

Cargo dropping

Use of throttle

Spotting.

Altitude.

Signals.

Radio operation.

Losing altitude when returning to base.

Amount of flap used.

Landings.

Parking procedure.

Amount of gasoline carried.

Amount of oil in motor or tank.

Amount of flying being done.

Use of Forest Service maps.

Sectional Aeronautical Charts available for possible flights to other forests.

Familiarity with area and landing fields.

Copy of Safety Code, R-6 Policy on Use of Airplanes and General Instructions on Airplane Use in Region 6.

Airports

Surface condition - smooth and level.

Presence of rocks or weeds.

Gopher hills and holes.

Approach obstructions.

Paint on approach obstructions.

Wind sock location and color.

Any roads crossing airport?

Are cattle and people kept from straying on landing area?

Airplane parking area.

Tie-down anchors.

Car parking area.

Run-up surfaced areas.

Telephone extension bell.

Hangar

General condition - floor clean? (dirt, grease, paper, etc.)

Debris in corners or along wall?

Dust-proof cabinet.

First aid equipment.

Fire extinguisher - type, location and condition.

Oil containers - clean, covered, protected from dust.

Gasoline strainers - clean and covered.

Stepladder - proper size and type.

Containers for rags - clean, oily.

Containers for debris.

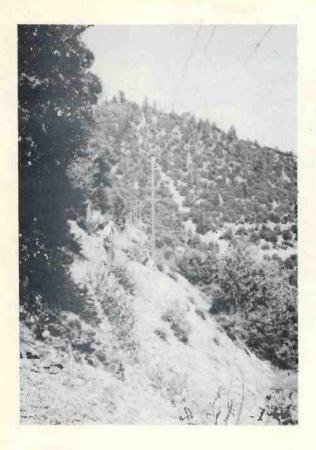
No Smoking signs - posted, observed,

Fire line around hangar.

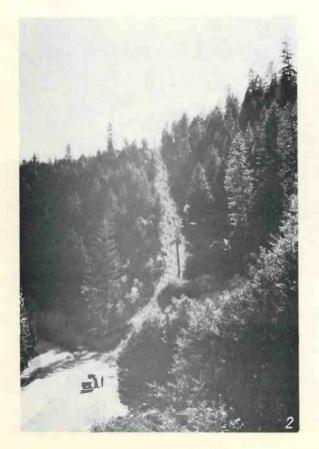
F. C. Hdbk. Issued 6-18-48

No. 45

III-6-12



Adequate width of clearing in this type. Note side clearance is adequate and that slow growing species beneath the line will not present a hazard.



Adequate width of clearing in this type as there are no spindly limber pole size trees.

Small trees under the line which may come in subsequently should be removed while still small to minimize the clearing job and the resulting slash.

R-6 F.C. Hdbk.
Page Added 7-28-53
No. 77



Adequate width of clearing.
No necessity of disposal
of stumps or light fuels shown
in photograph. Logs here are
well separated and do not need
to be disposed of.



Adequate width of clearing.

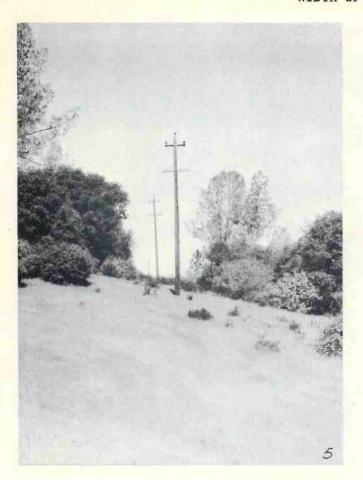
Note that trees are sturdy and not subject to snow bend or excessive swaying as would be the case in certain types where saplings are tall and spindly.

Logs in right foreground should be separated so they will not result in an intense heat due to a concentration of heavy fuels. No necessity for disposal if separated.

R-6 F.C. Hdbk.
Page Added 7-28-53

No. 77

WIDTH OF CLEARING



Adequate width in foothill type. From a fire prevention standpoint, it is not necessary to clear the annuals and shrubs that appear in the photograph.

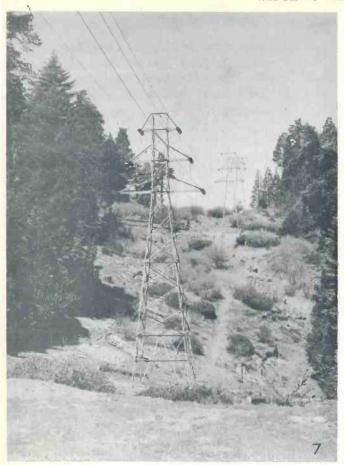


Adequate width in this type.

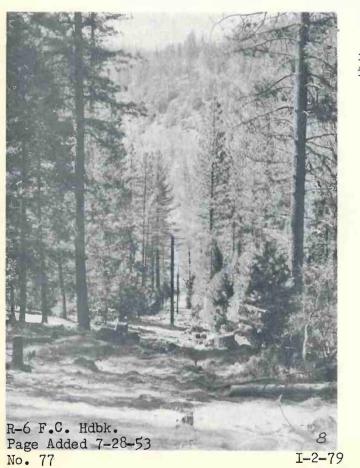
No necessity of clearing beneath
the line or around poles.

R-6 F.C. Hdbk. Page Added 7-28-53 No. 77

iii



Adequate clearing for this type.
No necessity of removal of low
growing shrubs and brush. For fire
prevention purposes no clearing
necessary around these towers.



Clearing shown here is too narrow for safety from fire due to overhanging limbs and spindly saplings.

iν



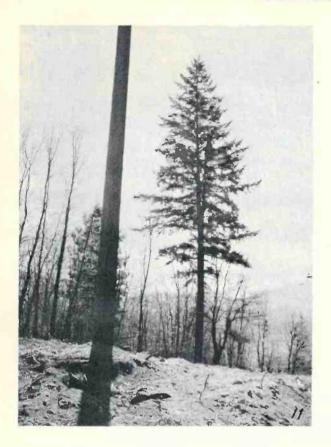
Snags at upper right will reach power line if they fall. They should be felled to prevent this from occurring.

Similarly rotten trees, spike top trees, trees with cat faces, forked trees, trees leaning toward the line, or those with other defects or weakness should be felled.

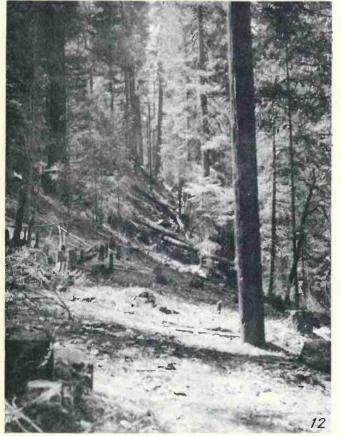


Such leaning trees should be felled to prevent later falling on the line and possibly breaking a conductor.

R-6 F.C. Hdbk.
Page Added 7-28-53
No. 77

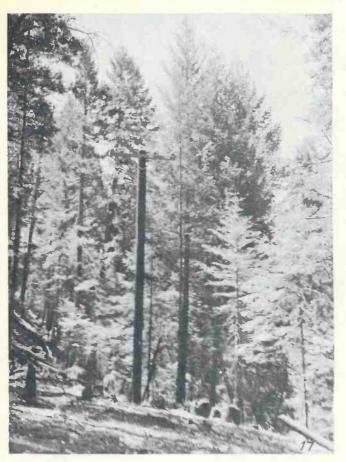


Forked trees often break at the fork during high winds. Such trees should be felled to prevent falling on or breaking the line at some future time.

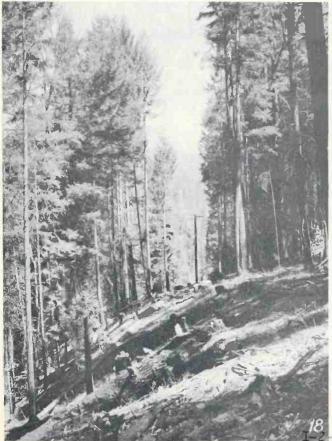


Narrow clearing offers possibility of side contact of limbs at present, and with a small amount of future growth, also from drooping limbs. In highly productive areas, such as that shown, the trees should be pruned. In low productive areas the clearing should be wider.

R-6 F.C. Hdbk.
Page Added 7-28-53
No. 77



Saplings and small poles which have grown tall and spindly in a dense stand of timber when exposed by cutting are weak and limber. There is a definite risk of such trees contacting the line when swayed by winds or natural bending of the limber trunk. The weight of winter snows commonly bends tall limber trees of small diameter that subsequent ly fail to straighten up. The possibility of bent trees overhanging or close to the conductors remaining that way into the fire season presents hazards that should be removed by cutting such trees before they become a threat.

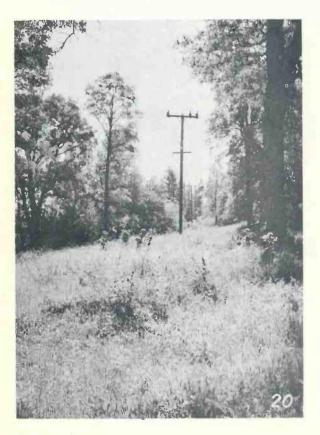


Insufficient clearing of small limber saplings and poles exposed by opening up the stand. Subject to excessive swaying and snow-bend.

R-6 F.C. Hdbk.
Page Added 7-28-53
No. 77



No clearing necessary in sage brush type in foreground.



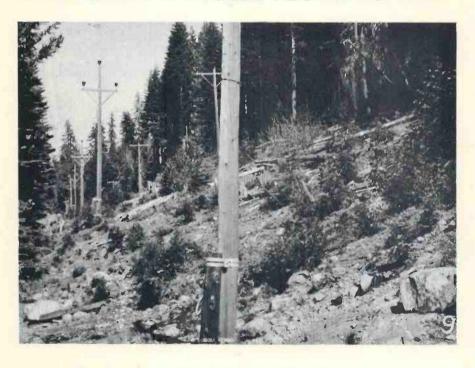
No clearing of annuals required by Forest Service as a fire prevention measure.

Small oaks beneath the line in the foreground should be cut before their removal becomes a falling job with resulting slash that will need to be disposed of.

R-6 F.C. Hdbk.
Page Added 7-28-53
No. 77

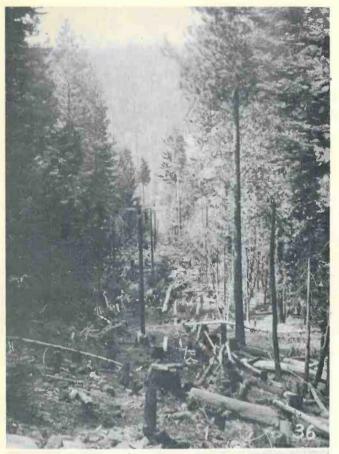


Heavy fuels (logs) are separated and will not cause intense heat. No further treatment in situations similar to that shown.



Criss-cross of logs and stems (heavy fuels) should be separated to prevent intense heat interfering with fire fighting or causing a flashover.

CLEARING BENEATH THE LINE SEPARATION OF HEAVY FUELS

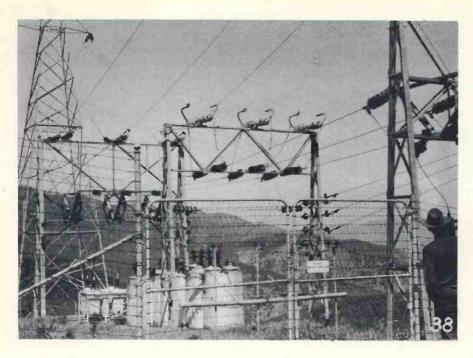


Heavy fuels (logs and stems) shown in photograph should be separated so that they will not create intense heat if a fire occurs. Intense heat and smoke can prevent control work on a fire and has resulted in fire-causing flash-overs at other points on the power line.



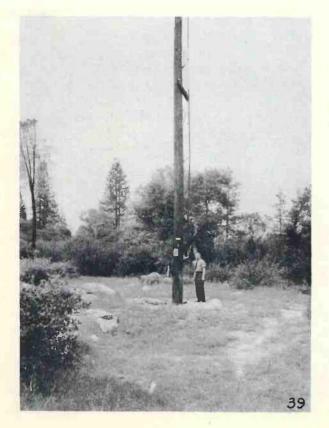
Larger fuels, logs and stems, at the right are sufficiently separated to prevent generation of intense heat should a fire occur. Control would not be made more difficult or result in power flashovers from the smoke or flame as would be probable with concentrated heavy fuels.

No further treatment necessary except young trees under line should be cut before they 6g For large enough to make a major job of falling or slash disposal. Page Added 7-28-53
No. 77



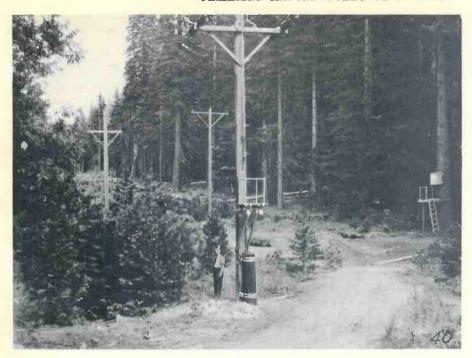
Switching and transformer substation or switch yard. Enclosure should be cleared to mineral soil of annual vegetation and small shrubs or trees while removal is a minor job. Clearing outside the enclosure should be done for a radius of ten feet from the tower in right foreground to prevent careless smoker fires being started by workers.

This substation has not been properly cleared.



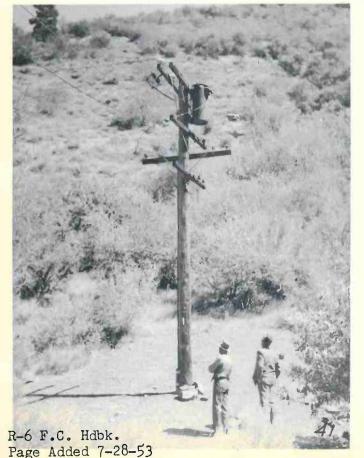
Switch pole. Area of ten feet radius should be cleared around base of pole to prevent workers at the pole from starting smoker or other fires resulting from carelessness.

R-6 F.C.Hdbk.
Page Added 7-28-53
No. 77



Switch pole. Clearing around base of switch pole should remove annuals and reproduction to a radius of 10 feet from the pole.

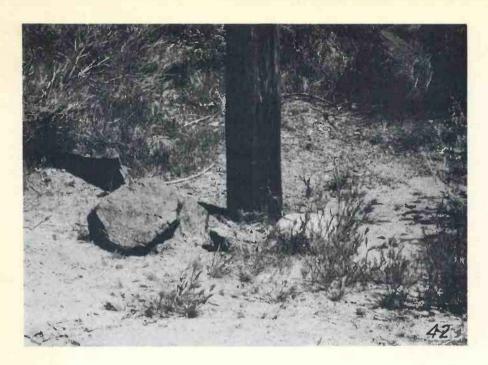
Reproduction beneath line should also be cut while still small since it is then a minor job as compared with clearing the same trees after they have grown to 8" to 12" diameter and 20' to 30' tall; also much smaller job of disposal of the slash and logs.



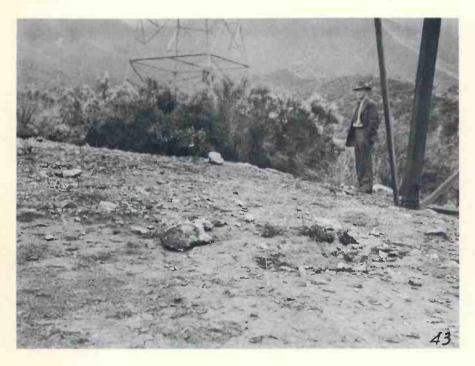
Transformer pole. Clearing around base of transformer pole is satisfactory except radius of clearing from the base of the pole should be 10 feet.

I - 2 - 87

xxii



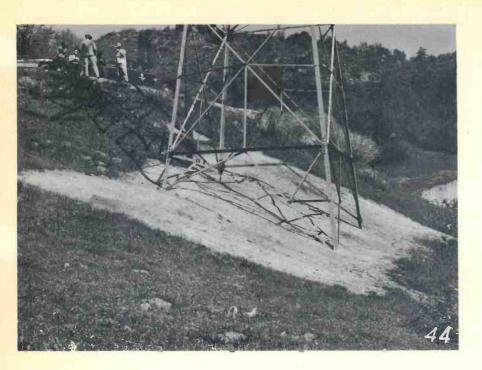
Inadequate clearing of small shrubs and annuals around base of a transformer pole. Should be cleared to mineral soil for a radius of 10 feet.

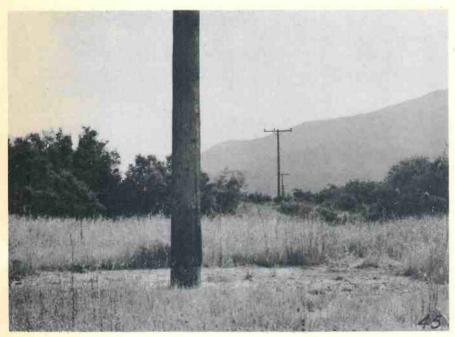


No clearing required by the Forest Service for fire prevention purposes in similar types except around special purpose poles or towers -- those bearing switches, transformers, dead ends, telephones, or other facilities where company employees may work more frequently than other poles on the line.

Company may choose to clear around poles and towers to protect the structures from surface fires at or adjacent to the base of the structures.

R-6 F.C. Hdbk.
Page Added 7-28-53
No. 77



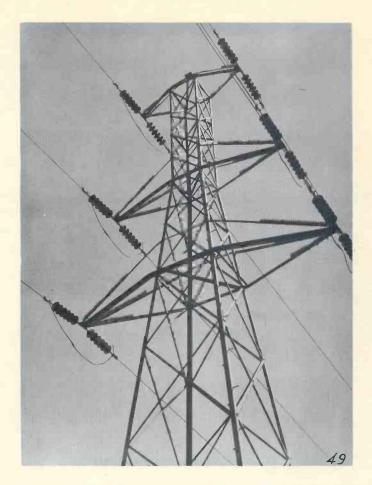


No clearing required by the Forest Service for fire prevention purposes in similar types except around special purpose poles or towers -- those bearing switches, transformers, dead ends, telephones, or other facilities where company employees may work more frequently than other poles on the line.

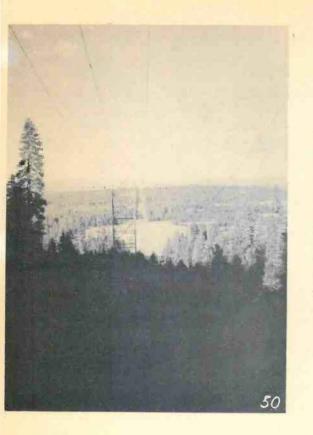
Company may choose to clear around poles and towers to protect the structures from surface fires at or adjacent to the base of the structures.

R-6 F.C. Hdbk.
Page Added 7-28-53
No. 77

SPECIAL STRUCTURAL MEASURES BIRD GUARDS



In some areas large birds have caused fires from contact with the conductors while roosting on the towers. In such cases bird guards as shown in the photograph are used - saw-tooth strips on the sloping braces.



Effect on timber production. The photograph illustrates that even essential clearing takes considerable land from timber production. A 200' swath means almost 25 acres to the mile or approximately 4% of a 640 acre section. Unneeded clearing along power lines decreases production by just the amount of possible production on the land unnecessarily cleared. An extra unnecessary 50' on each side of a power line means 12 acres out of production that is uncalled for. Hold timber clearing to what is actually necessary for fire prevention purposes, electrical transmission, and for reasonable allowance required in construction of the power line.



Danger of erosion. In certain types of soils and slopes complete clearing of all vegetation may result in erosion that will clog stream channels or damage improvements or roads lying below. In such cases low growing species should be left to protect the soil. (In most other instances it is not necessary to require clearing of these low growing species for fire prevention purposes.)

Page Added 7-28-53 No. 77

xxV14191

FIRE CONTROL HANDBOOK REGION 6



PART I PREVENTION

CHAPTER 3

LAW ENFORCEMENT

REGION 6 FIRE CONTROL HANDBOOK

PART I
FIRE PREVENTION
Chapter 3
LAW ENFORCEMENT

PART I - FIRE PREVENTION - Chapter 3

LAW ENFORCEMENT

Table of Contents

	Page No.
Introduction	I-3-1
Prevention of Law Violation and Trespass	I-3-1 I-3-1 I-3-2
Advance Preparation for Handling Law Enforcement	I-3-2 I-3-2 I-3-3 I-3-3
Applicable Laws Which Law to Use Investigation of Man-caused Fires Importance of Prompt Investigation Information Needed for Successful Prosecution What to do on Arrival at Fire Searching for Clues Recording Information Preserving Evidence Following Up Clues Interviewing Witnesses and Suspects Affidavits and Signed Statements Enforcement of Fire Precautions Power of Arrest Complaints Warrants of Arrest Search Warrants Action Before a Justice of the Peace Federal Cases Reports	I-3-3 I-3-3 I-3-4 I-3-4 I-3-5 I-3-5 I-3-6 I-3-7 I-3-8 I-3-8 I-3-9 I-3-10 I-3-11 I-3-11 I-3-12 I-3-12 I-3-13 I-3-13
Civil Cases	I-3-14 I-3-14 I-3-14 I-3-15 I-3-16

	Pag	e No.
	Reports	-3-16
	Financial Standing of Trespasser	-3-17
	Violation Charged	-3-17
	Detailed Explanation of the Case	-3-17
	Damage	-3-18
	Suppression Costs	-3-19
		-3-21
	Action Taken and Recommendations	-3-21
	Attachments	-3-21
	Map	-3-21
	Liens	-3-22
App		-3-24
	Federal Laws Not Given in F. S. Manual	-3-24
	Sample Law Enforcement Forms	-3-26
	Affidavit	-3-26
	Complaint	-3-27
	Power of Attorney	-3-29
		-3-30

LAW ENFORCEMENT

Introduction

The Forest Service Manual, Volume III, Chapter M, contains instructions on fire law enforcement and fire trespass applying throughout the Service. These are supplemented by regional instructions, on insert sheets, dealing mainly with local policy. Forest officers should be familiar with the manual instructions and should refer to them as necessary in handling cases. They should also be familiar with state forest laws relating to fire prevention and suppression and any handbooks or instructions issued by the state foresters outlining procedure under state laws. For accounting procedure in fire trespass cases, see Chapter 4, Part III of this handbook and Chapter II of the CCC Handbook.

The purpose of this chapter of the handbook is to describe in more detail than is desirable in the manual the procedure to be followed in fire law enforcement and trespass activities. It is not intended to duplicate instructions to be found elsewhere, but there is necessarily some overlapping. The object is to assist forest officers as much as possible in their efforts to prevent trespass and to make creditable investigations and reports in the cases that arise.

Federal fire laws and regulations are given in Chapter M, Volume III of the manual, and state forest fire laws are contained in pamphlets issued by state foresters. A few federal laws not found in the manual are given in the appendix to this chapter. When state laws are amended, forest supervisors will be advised to request a supply of revised state pamphlets or supplements from state foresters if not otherwise supplied. If the state pamphlet is amended and reprinted, it is important to destroy all old copies as soon as the new supply is received, and if a supplement is issued or new laws are passed, to make notations as to amendments in the pamphlets on hand.

Prevention of Law Violation and Trespass

Criminal Violations

Practically all of the smokers and campers fires, and many of the debris burning, lumbering, railroad, and miscellaneous fires result from violations of criminal laws or regulations. Incendiary fires, of course, are always set in violation of law. There are also violations of legal restrictions and failures to comply with legal requirements which are intended to prevent fires from starting or escaping. For the regional policy on action to be taken for minor violations refer to the discussion under the topic "Criminal Cases," NF-M2, R-6 page 2.

Efforts to keep criminal violations to the minimum fall into four general classes:

1. Education and information. Forest users and residents within the forest protective unit must be informed, by posters, contacts, and by other means, of legal restrictions and legal requirements so they will not violate

them through ignorance. They should also be advised of the reasons for these restrictions and requirements, and <u>how</u> to prevent legal fires from escaping, with a view to securing intelligent compliance and maximum cooperation. It is better to prevent man-caused fires than to have law enforcement cases.

- 2. Prevention of violations by giving service to the public in connection with campfire permits, registration, burning permits, and any other requirements, and such assistance and supervision as can be given in connection with lawful debris burning and logging operations.
- 3. Inspection of campgrounds and summer homes, and of industrial and land-clearing operations to see that required precautions against fires are taken. This is one of the major prevention measures and if effectively used both criminal and civil cases will be avoided.
- 4. Enforcement of laws and regulations through administrative or legal action. It must be realized that the best possible effort under 1, 2, and 3 will not eliminate all violations, although it will greatly reduce their number. A further reduction can be effected by strict and impartial enforcement of the law. If many law enforcement cases arise it is well to analyze prevention efforts and take appropriate additional preventive measures.

Instructions relating to the first three classes of prevention effort described above are in the Forest Service Manual, NF-A2-2, and Chapter 1, Part I, of this handbook. With respect to No. 1, the Manual, GA-J, should also be studied. This chapter of the handbook and the instructions in the Manual, NF-M, are particularly concerned with No. 4.

Failure to Redeem Civil Responsibility

Violators of criminal laws are responsible for suppressing any fires that result from their acts, and for damage to the property of others due to such fires. Owners of land on which a fire protection assessment or tax is not paid, or on which an extra hazard has been created and not released or cleared by the State Forester, are responsible for making every reasonable effort to suppress fires on their land, regardless of how the fires were caused. A similar responsibility rests on logging operators where fires are started in their operating areas from any cause. It is important to see that land owners and operators understand their suppression responsibility and, if possible, to persuade them to redeem it. In this way civil trespass cases can be kept to the minimum.

Attempts to get an operator or land owner to take proper action on a fire must not result in inadequate suppression effort if there is immediate danger of the fire getting away. In such a situation, the forest officer must take necessary and adequate suppression action at once, if the responsible party does not, or supplement the responsible party's efforts if they are not sufficient. For the general policy on action to take on fires for which others are responsible, reference should be made to NF-A4-4, R-6 Page 1, and to the topic "Civil Cases," NF-M2, R-6 Page 4.

Advance Preparation for Handling Law Enforcement

Contacts with Public Officers

Before the fire season begins, the district ranger should interview all

justices of the peace and county attorneys who may be concerned with cases in his unit, for the purpose of informing them as to his law enforcement problems and obtaining whatever information he may need from them. He should also contact county and state police officers to enlist their co-operation in enforcing the fire laws. United States Commissioners should also be interviewed by district rangers, if nearby; otherwise by the supervisor or a staff officer. The names and locations of all these officers should be listed in the local fire suppression plan.

Protective Status and Ownership Records

These records are important tools in law enforcement and trespass work. They should be checked before each fire season and kept up to date. When a fire is reported, it is important to know whether it is on contributing or non-contributing land. Non-contributing lands are private lands not on the tax roll for fire protection, listed with a protective association, or contracted by the owner to the Forest Service for protection. Usually non-contributing lands will be non-forest, as grass, sagebrush, or juniper, or lands listed as private patrol. Since owners of non-contributing lands are responsible for suppressing fires thereon, it is essential to have their names and addresses at hand, so that no time need be lost in notifying them when such fires are reported. Each district ranger should have these records for his district and protective area, and usually complete records for the forest should be in the supervisor's office.

Record of Special Hazards and Operating Areas

Land owners are responsible for the control of fires that start or spread in slash areas for which clearance or release has not been issued by the State Forester, even though the lands are contributing and the owners are not responsible for the origin of the fires. If an operation is being conducted, the operator is also responsible. It is therefore essential that the supervisor and the district ranger have a record of all operations, unburned and unreleased slashings, and areas covered by releases or clearances, with names and addresses of all responsible parties. Where a land owner has sold timber and the purchaser has contracted the logging, the timber owner as well as the land owner and operator may be responsible for fire suppression. Reference should be made to Chapter 1, Part I of this handbook and to NF-A2-2, "Cumulative Hazard Map."

Criminal Cases

Applicable Laws

Criminal fire laws are those which provide penalties for violation consisting of fines or imprisonment, or both. Federal action is taken under Section 52 or 53 of the Criminal Code, or under Regulation T-1. The Criminal Code applies to all Government land; Regulation T-1 to national forest land only.

Numerous state statutes apply to all forest lands in the state, regardless of ownership. The Forest Service elects to apply state laws to

national forest lands. Most violations of these statutes are misdemeanors; i.e., crimes punishable by fine or imprisonment for not to exceed one year, or both. Violations of Regulation T-1 or Section 53 of the Criminal Code are also misdemeanors. Since Section 52 provides for imprisonment in the penitentiary for more than one year, violation of this Federal statute is a felony. Violation of Section 107-226, Oregon, is likewise a felony.

Which Law to Use

Criminal action on private, state, or county land must be taken under state law, except for failure to extinguish a fire near inflammable material on land owned by the United States, which would spread to such land if not checked. In such cases, action can be taken under Section 53 of the Federal Criminal Code.

Under state laws, minor cases may be taken before justices of the peace. This results in quicker action, and less inconvenience to the offender than if the case were prosecuted under Federal law. Quick action is important and, in most cases, putting the offender to the inconvenience and expense of appearing in Federal Court is not warranted. For this reason the state law should be used, even if the Federal law applies, except under the following conditions:

- l. When the offense is not covered by state law, but is a violation of a Federal law or regulation; e.g., smoking in an area closed to smoking under Regulation T-1(H).
- 2. When, because of local prejudice or for other reasons, a miscarriage of justice in the local court may result.
- 3. In most particularly flagrant cases or where the offense is malicious; e.g., incendiarism.
 - 4. Where administrative action rather than court action is desirable.

If the district ranger is in any doubt as to the law or procedure to use, he should consult the supervisor. If necessary, the supervisor should take the matter up with the regional forester. County attorneys should be consulted, as necessary, on legal questions involving state laws, and if the regional law officer's advice is urgently needed, he can be called by telephone.

Investigation of Man-caused Fires

Importance of Prompt Investigation: When a man-caused fire is discovered or reported the district ranger has two duties: (1) To see that the fire is put out, and (2) To determine whether the law has been violated, and if so, to make every effort to apprehend the offender and assemble evidence sufficient to convict him, or to otherwise treat the case as provided in NF-M2, R-6 Pages 2 & 3. Action on the fire must not be delayed to investigate its cause and look for evidence, but these things should be done as quickly as possible and care should be taken to prevent clues in the vicinity of the fire from becoming obliterated. It may be practicable to have one or two men looking for evidence while others put out the fire. It is important that the investigation be started and carried on with all possible speed.

Information Needed for Successful Prosecution: Proof beyond a reason able doubt is necessary to convict an offender in a criminal case. This means that direct testimony of eye witnesses or a sufficiently strong chain of circumstantial evidence must be offered. To be complete, the testimony must answer the following questions:

- 1. What was the offense? Determine what law or regulation was violated, and what the violation consisted of.
- 2. Where was the offense committed? Township, range, section, and smallest practicable subdivision. Ownership of land. In unsurveyed country, name creek, ridge, road, trail, or other topographic or cultural feature, and approximate legal subdivision (unsurveyed).
- 3. When was the offense committed? Determine the exact time, if possible. If not, fix the time within the shortest possible period.
- 4. How was the offense committed? This question ties in with Question 1, but includes more details and also whether the offense was accidental, willful, or malicious.
- .5. Who committed the offense? Name, address, occupation, business in the area where offense was committed.
- 6. Why was the offense committed? Motive, if not accidental. Particularly important in incendiary cases.

It is advisable for an investigator to memorize the six words: What, where, when, how, who, and why, and find the answer to each one.

It is much easier for an investigator to answer the above questions to his own satisfaction than to assemble evidence that will convince a jury beyond a reasonable doubt. Individual judgment takes much for granted, but generally speaking, a court must have actual proof on every material point. When the investigator has obtained evidence on any point, he should ask himself whether it is sufficient proof and, if not, what else is necessary. He should keep an open mind and assemble all possible evidence. Thoroughness is particularly important in incendiary cases, and in other cases where it is unlikely that the suspect will plead guilty.

What To Do On Arrival At Fire: The first man or men at a man-caused fire should either hunt for clues immediately or make sure that these will not be destroyed before there is an opportunity to start the search. In many cases fast action on the fire with every available man will be imperative, but in some cases, a small fire will be smoldering or spreading very slowly, and the guard or members of the crew can search the immediate vicinity for clues before putting out the fire. In any case, fire fighters should be prevented from crowding around the fire until the ground has been examined for clues, and men and horses should if possible be kept off the roads and trails near the fire.

The guard or crew foreman, in addition to his own efforts, should request all men in the initial crew to keep their eyes open for clues, and to make a note of people met on trails or roads, with the time of meeting. The investigator should question all persons seen in the vicinity of the fire at the first opportunity, obtain written statements from them if desirable and possible, and record their names, addresses, and the substance of conversations with them.

Searching for Clues: Anything is a clue that may have any connection with the offense of the person who committed it. Some examples are tracks, campfire or lunch remains, cigarette or cigar butts, matches, threads pulled from clothing or blankets by brush or trees, hairs, scraps of paper or other things carelessly or unintentionally left by the offender. In incendiary cases it may be possible to find a "plant" used to set the fire. Everything found which cannot be accounted for without reference to the offense should be held as a clue, but nothing can be considered evidence until its connection with the action of the suspect is clearly shown.

When starting the search, the ranger, guard, or other officer should first locate the point where the fire started, then examine minutely the surrounding area. System is essential. The investigator should go carefully around the point of origin in widening circles, close enough together to make sure that all of the ground is minutely examined. It is a good plan to mark the place where each circle ends.

It may be possible to obtain clues away from the fire area, such as information indicating that a certain person or persons were in the vicinity of the fire at or prior to the time it was discovered.

Tracks are among the most important clues. If a fire is set intentionally, the offender may cover his tracks in the immediate vicinity, and in any case tracks left by the responsible person may be burned over or obliterated by others. If no tracks are found at or near the point where the fire started, it will be necessary to widen out. This wider search should be started at the most likely point and continued systematically, so that no area will be overlooked.

The purpose of investigating tracks is, of course, to identify them with persons, animals, or vehicles. They should therefore be studied in detail. Dimensions, shape, and distinctive markings, such as nails (present and missing), seams, creases, wear, and repairs, should be noted. Horse tracks will show whether the animal was barefoot, smooth shod, rough shod, or shod with specially shaped or weighted shoes. From imprints of automobile tires it may be possible to determine the make of tires, and this may lead to identification of the vehicle.

The age of tracks is indicated by sharpness of impression, moisture, condition of broken twigs, whether leaves and lumps of dirt have fallen into them, or they have been crossed by other tracks of any kind. Speed may be indicated by degree of slide at heel, depth of heel and toe edges, length of drag of toe, and distance between tracks. The class of person or animal can sometimes be deduced from tracks (riding boots, calked boots, city man's

shoes, horseshoes, vs. mule shoes, etc.); also, whether a man was drunk or sober, carrying a burden, or had a bodily defect.

Some indicators of direction of travel of automobiles on earth roads are as follows: Pattern imprint of tires is steeper and more distinct on rear side of indentations; stones shoved ahead by wheels, with track of stone behind it and dust piled ahead; sprinkling of dust or sand on rear side of stones or other obstructions passed over by wheels, the forward side usually being swept clean; direction of skid on side slopes and the jump off the forward side of obstructions if speed is sufficient; marks where wheels dropped into or climbed out of a rut; direction in which water or mud is carried out of mudhole or ford; traction slips on steep grades; the Y where a car was backed out from a roadside stop. Even if none of these indicators is conclusive, the sum of those noted in following the track closely for some distance should lead to a sure conclusion in most cases.

Recording Information: A record of everything found or done and of all conversations held or information obtained is essential. It will be needed in reporting on the investigation and will be very important if the case comes to trial. Items should be recorded in chronological order and at the time of the occurrence, conversation, or find. Writing the record at the end of the day is not satisfactory. The officer responsible for the investigation should be sure to obtain from the suppression foreman, or from other sources, the time the fire started, was discovered, and was attacked, and the time persons were met on trails or roads leading to the vicinity of the fire.

In incendiary cases and other cases likely to go to trial it is desirable to make a map showing the fire area and adjacent territory, point of origin, streams, roads, trails, buildings, camps, location of tracks. found, with direction indicated by arrows, location of articles found, and any other important data that can be shown graphically. The desirability of making photographs should also be considered.

Preserving Evidence: All articles found in the vicinity of the fire which may have any connection with the person responsible for starting it should be marked or tagged and preserved. The marking should be tied in to notebook entries. Any object found which offers a clue and may be used as evidence should not be touched until the object and its location has been accurately described and, where desirable, photographed. The object should then be picked up and anything described that was not evident when it was examined in place. The district ranger should take charge of all articles found.

If man tracks, horse tracks, or vehicle tracks are found they should be carefully protected until they can be described and sketched or photographed. A sketch should show dimensions and any peculiar markings. If photographs are taken, the camera lens must be exactly parallel to the surface photographed, to avoid distortion of perspective.

Torn papers can best be pieced together by first finding the corner pieces, then the edges, then working to the interior. The pieces should be pasted on transparent paper or tracing linen, as printing or writing on both

sides may be important. If writing is not in copying ink or indelible pencil, paper fragments may be moistened by holding in steam from teakettle, which helps to straighten them if badly curled or bent. Dim writing comes out plainly in a photograph.

Following Up Clues: Articles or tracks found in the vicinity of the fire, or other clues, are of no value unless they can be used in building up a chain of circumstantial evidence that will fix responsibility upon one or more individuals. This will often tax the ingenuity of the investigator. It may be possible to follow tracks to a dwelling or other place and ascertain definitely that they were made by a certain individual, or by a certain animal or vehicle the ownership of which can be obtained. Descriptions of persons, animals, or vehicles seen in the vicinity of the fire may sometimes be obtained from persons who saw them. Partial descriptions are sometimes obtainable in other ways; e.g., a car might be traced by tire treads, particularly if all tires are not of the same make; horsehair found might indicate the color of the animal.

In trying to compare tracks with shoes, to trace articles found to their owners, etc., tact should be exercised, so as not to antagonize innocent persons. In important cases, particularly those involving incendiarism, search warrants should be used if necessary. Where desirable, the cooperation of state or county police officers should be sought in following up clues.

Interviewing Witnesses and Suspects: It is important that all persons who may know anything about the origin of the fire be interviewed. This is the only chance to find and convict the offender if no material clues can be found. When suspected persons should be questioned will depend on the circumstances. Others ordinarily should be questioned as soon as practicable after the fire is discovered, while events and observations are clear in their minds and before they leave the neighborhood if they live at a distance. In some cases, particularly with reference to employees of industrial operators, a witness will furnish valuable information if approached at the time of the fire or soon thereafter, but will refuse to tell what he knows, or will make evasive answers, if approached later on, after he has had time to think the matter over.

Most people do not like to be interviewed by an officer who is investigating a law violation, because of their reluctance to testify in court or to be mixed up in the case in any way. Reluctance or antagonism can often be overcome by telling the witness that you are required by regulations to obtain the facts and will greatly appreciate any information he can furnish. This puts the interview on the basis of routine duty and dispels any suspicion the witness may have that the investigator is trying to implicate him.

Before starting an interview the investigator should go over the six questions previously mentioned and be prepared to get all the information the witness can furnish. It is usually best to let a witness tell his story straight through in his own way at the outset, then to question him until it is reasonably certain that he cannot add anything more of value. Plenty of time should be taken.

The story should be written down as told unless the witness shies at this, in which case it should be done at the conclusion of the interview.

Opposition to having a statement written may often be overcome by saying, "I'd like to put this down, so that I will get it right in my report." If the interviewer is tactful, the witness will doubtless help him to get everything straight, and then can hardly refuse to sign the statement after it has been read to him and any changes he desires have been made.

If a witness will talk but will not sign a statement, it is desirable to get him to tell his story in the presence of two or more forest officers or other dependable persons, then to write down what he said as nearly verbatim as possible. Those who heard it can then be called as witnesses, if necessary, and can refer to the memorandum to refresh their memories. In addition to what was said, the circumstances of the conversation, such as time and place, persons present, etc., should be recorded.

A good many minor violations result from thoughtlessness, such as leaving a campfire unattended or throwing away burning tobacco. Courteous treatment is particularly important in such cases. If the offender is approached and questioned with the evident purpose to do only one's duty, and with regret for the inconvenience caused, he is likely to plead guilty and the case can be settled with the least trouble and expense to all concerned.

In interviewing suspects and hostile witnesses, particularly incendiary cases, thorough preparation is very important. Preliminary knowledge of their connections and interests should be acquired, the information needed which the suspect or witness can probably furnish should be outlined, and the circumstances and conduct of the interview should be carefully planned. If possible, interviews with such witnesses, especially suspects, should be held at the supervisor's or ranger's office, or some other place away from their familiar surroundings and people. It is usually best not to interview two or more hostile witnesses together. Plans should provide for interviewing them separately whenever possible, and for interviewing a group of related witnesses in the best order to prevent collusion.

In planning and conducting an interview with an enemy to the case, particular care should be used to keep it strictly on an official basis, with no effort to put the witness at ease. That he will alibi, evade, or falsify is to be expected, and if he does, the object should be to break down his story and get at the truth. Since best results require experience and special training in such work which most forest officers do not have, it is desirable to enlist the cooperation of state or county police officers in all incendiary cases. However, the forest officer should make his own record of the interview and attempt to get the witness' signature to his story, even though it is known to be false in many particulars.

Affidavits and Signed Statements: An affidavit or a signed and witnessed statement should, if possible, be obtained from every witness interviewed except when little or no information is obtained. Written statements are valuable as protection to the complainant from possible suits for false arrest or malicious prosecution, to give the prosecuting attorney a line on the testimony to be expected, to prevent witnesses from going back on their stories if called on to testify, and for use in refreshing their memories before they go on the witness stand.

*Semple form of affidavit or signed statement is given in the Appendix. An affidavit must be sworn to before an officer authorized to administer oaths in criminal cases. An administrative order issued by the Secretary of Agriculture November 5, 1943, designated all officers and employees of the Forest Service engaged in law enforcement to administer or take oaths, affirmations, or affidavits intended for use in prosecutions or proceedings connected with law enforcement by the Forest Service (Manual, NF-M8, page 2). Section 107-205, Oregon Compiled Laws, Annotated, authorizes state fire wardens or rangers to administer oaths in connection with investigations of violations of forest laws. Affidavits may also be sworn to before any justice of the peace, judge, or other state judicial officer authorized to administer oaths, or before a U.S. Commissioner or U.S. Judge.

The chief value of an affidavit is that if it contains false information or if the affiant later gives testimony on the witness stand at variance with it, he may be prosecuted for perjury. For this reason and because statements made under oath are less likely to be deliberately falsified, it is desirable to obtain affidavits in incendiary cases and in other cases that may go to court. Oregon officers who obtain affidavits when investigating violations of the act mentioned above should be careful to sign the jurat over their title of state fire warden.

*It often happens that a witness is willing to sign a statement, but will not swear to it even though it is the truth. In such cases, the statement should simply be signed by the witness and acknowledged by the investigator. If others are present, it may be desirable to have them also acknowledge the statement as signed in their presence.

If an accused or a suspected person signs a statement, whether he swears to it or not, the last paragraph should state that the foregoing is made by him voluntarily, realizing that anything it contains may be used against him. If the statement amounts to a confession, it should also state that it is made without promise or threat. A confession made to an investogator should, if possible, be witnessed by a third party.

Enforcement of Fire Precautions

Numerous requirements designed to prevent fires from starting are effective under state laws or Regulation T-1, or both. It is necessary to handle violations of these requirements, as well as law violations resulting in fires, in order that they will serve their intended purpose. The procedure outlined for investigation of man-caused fires should be followed where it applies. However, in most cases, when a law violation where no fire is involved comes to a forest officer's attention, there will be no doubt as to the identity of the violator. For example, a ranger or guard finds a traveler in a closed area without a permit, or smoking while traveling where this is prohibited, or a camper without a campfire permit where one is required. Inspectors of industrial operations know who is responsible if required equipment is missing or other required precautions are not taken.

Where court action is to be taken, the offender will usually plead guilty, but if he does not it will be necessary to prove the charge. For this

R-6 F.C. Hdbk.

*Revised 5-5-44

No. 20

reason, the forest officer should be prepared to produce witnesses who can testify to the violation when this is possible. However, the fact that the forest officer is the only witness should not prevent taking the offender before a magistrate if that is the thing to do.

While precautions required by timber sale and other Government contracts are mostly covered by state laws, it is usually desirable to enforce the requirements through administrative action under the contract, rather than through criminal action (see Forest Service Manual, NF-A2-2, and instructions under "Administrative Action" in this chapter). However, contractors should understand that their operations are subject to state law, and where compliance with requirements can not be obtained otherwise, action under state law should be taken. When such action is necessary on private lands, or as a last resort in national forest operations covered by contract, the county attorney should be consulted where there is any doubt as to legal procedure.

Power of Arrest

All forest officers, including guards, have power of arrest in connection with violations of Federal laws and regulations affecting the national forests, and also in the enforcement of state laws if they are under appointment as state warden (Oregon) or state ranger (Washington). They may arrest without warrant if an offense is committed within their view, or to prevent the commission of a crime in their presence. A forest officer without an appointment as state warden or ranger has the same power of arrest as any other citizen for state offenses committed in his presence.

It is not desirable for guards to make arrests without first consulting the district ranger, except under unusual circumstances, such as when a person committing an offense is likely to escape. The ill-will that might be created if an arrest were unjustified, and the attendant legal complications that might follow, make it very desirable to leave the decision to the district ranger whenever time will permit.

In many minor cases the offender is willing to appear voluntarily and formal arrest is not necessary. If he is not willing and the offense was not committed in the officer's presence, a warrant of arrest will be needed.

Complaints

In state cases a complaint must be signed and sworn to by the forest officer whether the offender pleads guilty or not. It must designate the statute violated and give such particulars as to person, time, place, and manner as will satisfy the magistrate with whom it is filed and will enable the defendant to understand clearly the character of the offense (refer to Appendix for sample). If the case is likely to come to trial, extreme care is necessary in drawing the complaint, as the court action will be based on it. For this reason the assistance of the county attorney should usually be obtained in preparing it.

Warrants of Arrest

If it is necessary to arrest an offender for a misdemeanor under state law, the justice of the peace should issue the necessary warrant when a satisfactory complaint has been filed with him. In case any justice refuses to do this or expresses hostility to enforcement of the fire laws, the facts should be reported to the regional forester.

Ordinarily the serving of warrants issued by justices of the peace should be left to county police officers, as it is a part of their work and they receive fees for it. This will-not only save forest officers' time and expense but will help to maintain good cooperation. If it is necessary for a forest officer to serve a warrant he should consult the county attorney or a police officer as to legal details.

Search Warrants

A search warrant may be secured by a forest officer from a U. S. Commissioner in Federal cases, or from a justice of the peace in state cases if the officer is under state appointment as warden or ranger. It is necessary to make affidavit that, on reasonable information or belief, the premises to be searched are thought to contain articles which it is desired to seize or examine against the owner's will. A search warrant is required, if the owner objects, in order to lead a horse out of a barn to measure its tracks, or to search a pack or vehicle.

Permission to search without warrant can sometimes be obtained from an owner by an officer clearly entitled to obtain a warrant by pointing out that if the owner had no connection with the offense he has no reason to object and that objection will only cause the officer the trouble of getting a warrant and justify his suspicion. If it is desired to seize any articles found, this should not be done without a warrant.

As with warrants of arrest, the serving of search warrants in state cases should be left to state or county police officers, except in extreme emergencies. If necessary for a forest officer to serve such a warrant he should consult the county attorney as to legal requirements. In Federal cases, if necessary or desirable to obtain a Federal warrant, full details as to serving should be obtained from the commissioner.

Action Before a Justice of the Peace

Justices of the peace have authority to decide cases involving misdemeanors under state law. The presence of the offender is not absolutely necessary, but he should be required to appear except in cases where he is willing to plead guilty and it is impracticable to bring him before the justice immediately. In such cases, if prior arrangements have been made with the justice, the offender may sign a power of attorney (see Appendix) authorizing someone to appear for him, or his plea may be made by letter or over the telephone.

If the offense is a felony, such as wilfully and maliciously setting fire, the case can be tried only upon indictment by the grand jury, but a

justice of the peace can hold a hearing to determine probable guilt. The offender must appear in person and he may be held under bail for action of the grand jury or, in default of bail, he may be committed to jail.

If the offender does not plead guilty, it is, of course, necessary to arrange for the witnesses to appear voluntarily, or to have them subpoensed. In such cases the decision as to whether the evidence is sufficient to warrant prosecution rests with the county attorney. If he decides to prosecute, the forest officers will render all possible assistance in preparing the case for trial. Where necessary or desirable, the advice and assistance of the regional law officer should be requested.

Federal Cases

Criminal cases tried in the Federal Court are usually those involving wilful and malicious setting of fire, i.e., incendiary cases, or violations of departmental regulations which are not also violations of state laws. There may be cases, other than incendiary, involving violation of both Federal and state law which it is advisable to prosecute in the Federal Court. Whenever there is any doubt as to this, the regional forester should be consulted.

In Federal cases, arrest should be made in advance of indictment by the Federal Grand Jury only when absolutely necessary to prevent the escape of the offender or when the offense is committed in the officer's presence. Where an arrest is made the offender should usually be taken before the nearest U. S. Commissioner, but if this is impracticable or unduly expensive in time or money, he may be taken before a justice of the peace or other magistrate (Sec. 1014 U. S. Rev. Stat. See Appendix). Commissioners have authority to hold a hearing to determine the probability of guilt but not to fix penalties. If the commissioner considers the evidence sufficient, he will hold the accused under bond pending action by the grand jury. Similar action may be taken by a justice of the peace under the statute mentioned.

At a preliminary hearing it is not necessary to prove defendant guilty beyond a reasonable doubt, therefore only enough evidence should be presented to insure that he will be held. Preliminary hearings are undesirable in important cases, for various reasons, and it is generally better to submit the facts to the regional forester, so that the regional law officer can initiate action through the U.S. Attorney if the evidence warrants.

Since minor cases under Federal law must be taken to the Federal Court even where the offender is willing to plead guilty, and this may cause inconvenience and expense greatly out of proportion to the seriousness of the offense, the state law should be used in minor cases wherever possible (see Manual NF-A2-3 and 4).

Reports

Report on Form 874-20 is unnecessary in minor cases under state law, but in every case a brief memorandum should be made for the forest supervisor. It should give the information needed for the supervisor's monthly and annual reports required by the Manual, NF-MS, and any other information that will help to make publicity more effective.

Report in accordance with the Form 874-20 outline should be made in all Federal cases. It should bring out clearly all the facts and be supported by affidavits or signed statements, so that the Regional law officer and the U.S. Attorney can judge as to the sufficiency of the evidence and proceed without delay. Items under "Fire Trespass" in the outline that are applicable in criminal cases should be covered under Caption C in the report. A map need not be submitted if it is clearly unnecessary to illustrate the case. If a map is submitted it should be letter size unless a larger map is needed to show the data clearly. The original and duplicate of the report and all attachments should be forwarded to the Regional Forester.

CIVIL CASES

Basis of Civil Action

The Government as a land owner has the same legal rights as other owners to recover damage and costs due to fires for which private parties are responsible. Liens may be filed or action for debt taken under applicable state statutes. Action may also be possible under the common law when no state statute applies in a particular case. When necessary to bring civil suit, other than to foreclose a lien, it is always brought in the Federal Court by the U.S. Attorney. Action on a lien is brought in the name of the state for the benefit of the United States.

Investigation of Civil Liability

In any civil case it is necessary to prove that the defendant was negligently or criminally responsible for starting the fire or, if he did not start it, that he was responsible for its suppression and did not make every reasonable effort to control it without damage to the property of others. It is not necessary to establish proof beyond a reasonable doubt, as in criminal actions, but the case must be supported by the preponderance or weight of evidence. A thorough investigation must therefore be made to determine civil liability and all possible evidence must be assembled, including affidavits or signed statements of witnesses. See instructions under "Criminal cases - Investigation of Man-caused Fires" and "Civil Cases - Reports."

Serving Notice

In all civil suits it must be shown that the defendant had knowledge of the fire; otherwise he cannot be held negligent. Therefore, whenever it appears that there is civil liability in connection with a reported fire, notice should be served on all parties believed to have liability if the fire is menacing national forest or other lands for the protection of which the Forest Service is responsible. It should be served for small fires on which nothing is being done as well as for larger fires on which no action or inadequate action is being taken.

If an operator who does not own the land is responsible, notice should be served on the land owner as well as the operator, and if the timber being operated is owned by neither the operator nor the land owner, notice should be served on the timber owner also. Where a fire spreads over rands of more than

one responsible owner, each is required to make every reasonable effort to prevent its spreading from his lands to those of others. For this reason ownership of lands in the path of the fire should be quickly determined and notices served on responsible owners as necessary.

It is always best to serve written notice even though the responsible party is on the ground. Ordinarily Form 11-R6 should be used, but if forms are not immediately available, notice may be served on notebook sheet or other paper, or even verbally. It is very important that notice be served at the earliest possible time, as it may not be possible to collect costs incurred prior to the serving of notice.

Whenever possible, the notice should be handed to the responsible party or parties, but if this is not possible, every effort should be made to reach them by telephone or telegraph. Where notice is served verbally or by telephone, a record should be made and written notice should be mailed immediately. There should be one or more witnesses to verbal or telephone notices if possible. If all other means of communication fail, notice should be mailed to the responsible party at his last known address. Copies of all notices should invariably be retained.

Voluntary Service

See Forest Service Manual, NF-M2, and instructions in this chapter under "Prevention of Law Violation and Trespass." Where it is necessary for the Forest Service to take action on fires for which others are known or believed to be responsible, it is essential to avoid the defense that such action was voluntary. While the first objective is to stop the fire if it is spreading or in danger of spreading rapidly on National Forest lands or to other lands protected by the Forest Service, there should be a clear-cut understanding between the responsible party and the forest officer at the earliest possible time. Prompt and aggressive initial action, under dangerous burning conditions, must not be delayed under any circumstances while determin ing responsibility, serving notice, or determining the adequacy of the action being taken. The officer should see to it that the responsible party has no reason for believing that the Forest Service will fight the fire, with any available facilities, without cost to him. He should be called upon to redeem his responsibility and given an opportunity to do so. It should be made clear that any action by the Forest Service is taken at his request or because he is not taking adequate control action or is not in a position to do so, and with the expectation that the Government will be reimbursed. (See instructions on the back of Form 11-R6, yellow copy.)

If the responsible party requests the forest officer to take over the fire or to assist him in handling it, the officer should ask that the request be put in writing, that it state in detail the action or assistance requested, and that it contain an agreement to pay the cost. Such an agreement, if carried out, will absolve the signer from further responsibility for property damage where he is not negligently or criminally responsible for the origin of the fire. If such a request is made and the signer does not pay the cost in full, the Government can sue on contract.

The forest officers concerned should always have complete records and diaries supported by statements of witnesses as necessary, which will show conclusively what action the Forest Service took, why it was taken, and that it was not voluntary but was taken at the request of responsible parties or to protect the interests of the Government or the owners of lands contracted to the Forest Service for protection.

Interviewing the Trespasser

See Forest Service Manual, NF-M8(3). In every civil case, the responsible party or parties should be interviewed and given an opportunity to make a written statement. If no written statement is made, the substance of the conversation should be recorded in a memorandum. In minor cases, the district ranger may talk the case over with the trespasser, but in the more important cases, this should usually be done by the supervisor or a staff officer.

Except in supervisor's cases, the trespasser should not be informed definitely as to cost and damage until the record has been reviewed by the regional forester and instructions have been received from him. In supervisor's cases, the matter of compromise may be discussed at the interview, if desirable; in other cases negotiations for compromise should not be opened except upon instructions from the regional forester. However, if the trespasser desires to make a written compromise offer on his own initiative, it should be forwarded with the report. The trespasser's statement, or a memorandum of the conversation with him should invariably accompany reports sent to the regional forester.

Reports

A complete report in accordance with the outline on Form 874-20 is required in all cases involving damage to national forest resources, and usually in other cases where full settlement is not made voluntarily. If the Forest Service claim consists of fire fighting costs only and the trespasser pays the full amount, a brief memorandum is sufficient. Where it is apparent that the evidence obtainable is not sufficient to support a civil suit or the <u>financial condition</u> of the trespasser is known to be such that collection could not be made if a judgment were obtained, the facts may be set forth in a letter to the regional forester, who will either approve dropping the matter or request that a complete report be submitted.

Except in supervisor's cases that can be settled by the supervisor under the authority of Regulation T-10, six copies of reports and all attachments are required, as three copies must be sent to the Chief when prosecution or the acceptance of a compromise offer is recommended and three copies are needed for the files of the regional forester, supervisor and district ranger.

The reporting officer should study the Form 874-20 outline and see that no pertinent points are overlooked. If he has any valuable information not called for by the outline, it should be included. The report should be as brief as possible, but it should contain all essential facts bearing on the case. Opinions of the reporting officer or others should be excluded. All the facts needed by reviewing officers in Washington, D.C., should be in the report itself, not in a

letter of transmittal. However, explanation of recommendations or cost items, or any other information that will be of assistance to the regional forester but that does not properly belong in the report, may be given in a letter of transmittal.

Every report that must be forwarded to the regional forester should be carefully reviewed in the supervisor's office and if it is not satisfactory, the necessary steps should be taken to see that it is amended or entirely rewritten. It should be kept in mind that all compromise cases must be referred to the Treasury Department through the Solicitor's office and it is essential that the facts be presented in such manner that they will be clear to reviewers not familiar with local conditions, technical terms, persons, and places. If prosecution is to be recommended, it is even more important to present all the facts clearly for the information of the U. S. Attorney and, in many cases, the Attorney General. Names of local persons, for example, may be meaningless unless their connection with the case is shown. This may also be true of places, transportation routes, and physical features mentioned unless they are identified on the map or otherwise.

In writing the report the main headings, A to E, on Form 874-20 should be used, shortened if desirable, e.g., the heading for D should be "Witnesses." The letters A to E, may precede the headings or be omitted, but they should never be used alone. Reviewers outside the Forest Service will not have the Form 874-20 outline. Explanation and instructions for the various headings, in addition to those given on the form, are as fellows:

Financial Standing of Trespasser: It is important to ascertain and include in the report all possible information as to the trespasser's financial condition, so that his ability to pay the claim may be judged and a decision reached as to the action to be taken. If a compromise is recommended, the Treasury Department is not likely to approve it unless it is shown that no more than the amount offered could be collected by bringing suit. Unless the evidence is insufficient this will depend on the trespasser's financial condition. His property and other assets should be listed at actual values, together with encumbrances on property and other liabilities so that his net worth can be determined.

Violation Charged: In civil cases this will usually relate to state law, e.g., failure to make every reasonable effort to control a fire originating in the trespasser's slashing or operating area. The section of the law should be indicated and the trespasser's responsibility thereunder and how he failed to redeem his responsibility should be briefly stated. It is not necessary to go into great detail hore, as the action taken will be described under heading C of the outline. If no state statute was violated, the basis for the claim should be stated, such as responsibility under common law or an agreement to reimburse the Forest Service for its expenditures.

Detailed Explanation of the Case: A complete story of the case should be written under this heading, covering at least all the points given in the outline under "Fire Trespass" which apply to the particular case. The material should be well arranged and broken up into paragraphs of reasonable length. Avoid paragraphs of half a page or more. Subheads are desirable but not absolutely necessary.

It is not necessary to cover the various items in the order of their listing in the outline, e.g., the time the fire started may be given near the beginning of the story if desired. Care should be taken to avoid using terms that will not readily be understood by reviewers outside the Forest Service, e.g., in describing burning conditions, do not mention burning index. It is better to describe commonly understood factors, such as relative humidity, wind direction and velocity, and rainfall conditions.

It is not necessary or desirable to include a chronological record of the fire fighting in great detail, or to attach a log kept by a protective assistant or dispatcher. The time of all action pertinent to the trespass case is important, however. It is also very desirable to give full details as to the number of men on the job at various times and whom they were working for. This is something that is frequently overlooked by reporters. In going over the fire records preparatory to writing the report, the forest officer should select the information needed to make the action of the trespasser and the Forest Service clear, and if needed information is missing, he should make every effort to obtain it.

The exact time each responsible party had notice of the fire and what he said and did about it are very important. "If there is a possibility that collection of certain costs cannot be made because of delay in serving notice this should be explained, but such costs should not be omitted from the cost statement.

<u>Damage</u>: If the fire destroyed or damaged national forest resources or property, the damage should be summarized in the report, using the headings given under 12 in the outline, and a <u>separate</u> <u>statement</u> showing in detail how the damage values were arrived at should be attached to the report. No damage to other than national forest resources or property should be included.

The instructions herein should not be confused with damage appraisal instructions in the Forest Service Manual, NF-A3-8. For statistical purposes it is desirable to estimate and record all fire damage, and sufficient accuracy will be obtained by using the methods and tables given in the instructions referred to. But in trespass cases the damage assessed must be defended in discussions with the trespasser and perhaps explained and justified in a lawsuit. For this reason, each case should be considered on its merits and every effort should be made to determine damage values which there will be a reasonable chance of establishing in court if necessary. Unless other instructions are received from the regional forester in special cases, damage values computed should be limited to merchantable timber, natural young growth on commercial sites, plantations, non-commercial stands, forage, improvements, and property.

To arrive at defensible values a thorough field examination is necessary. and it should be made by or under the supervision of a forest officer who can qualify in court as an expert if necessary. However, in cases where intensive examination will involve a large amount of work, the circumstances and the chances for collection should be briefly explained to the regional forester by letter before the examination is undertaken.

The damage appraisal report attached to the trespass report should describe conditions and methods used in sufficient detail to enable reviewers to check the damage values, so that the delay and extra work involved in getting additional information from the field may be avoided.

Damage to merchantable timber, young growth, plantations, and non-commercial stands should be estimated according to appraisal methods used in land exchanges with such adjustments as are necessary to fit local situations. (See Forest Service Manual, Volume 6, Chapter H). Where partial damage occurs the value of the stand before and after the fire should be estimated. The difference will be the damage value to be included in the trespass report.

If salvage of sawtimber or other products, such as poles, ties, and cordwood, is practicable, they should be advertised for sale, with or without naming minimum stumpage prices, provided the sale is not objectionable for other reasons. If a sale is made the amount realized, less the estimated extra cost of administering the sale, should be deducted from the total damage estimated as indicated in the above paragraph.

If the fire destroys a merchantable stand or a stand of young growth on a commercial site and, as a result of the fire, natural reproduction will not be obtained, the cost of planting should be estimated and added to the timber damage. In such cases, where merchantable timber would have been harvested by clear-cutting, the value of trees that would have been sacrificed for seeding purposes should be deducted in the damage estimated.

The damage to forage will be estimated on an acreage basis at current rates paid for grazing privileges on private lands of similar carrying capacity and desirability. For example, if 500 acres of range are burned over so as to be useless for grazing purposes for a fullseason of six months and similar private land rents for 10 cents per acre for an equivalent season, the damage would be \$50. If the carrying capacity of the burned area is less than that of the private land, or the grazing season shorter, or if the damage does not prevent use of the range for the full season, the value of the forage destroyed would be correspondingly reduced. If the forage destroyed was inaccessible or not in demand, no damage should be assessed. If it can be conclusively shown that injury to the range was so severe as to prevent its use for a definite number of years, the forage value for each year should be computed as above and the total for the period included. Unless the number of years can be determined with reasonable certainty, however, only the value of the forage destroyed should be included.

The value of all Forest Service improvements destroyed, such as barns, fences, and telephone lines, should be based on the original cost of construction wherever possible; otherwise on the cost of replacement. In either case allowance should be made for depreciation. Any other Government property destroyed, e.g., machinery stored in a warehouse that was burned, should be valued in the same manner.

Suppression Costs. In computing items to be included in suppression costs it should be remembered that such items need not, and usually should not, check with the accounting records. Under Forest Service practice

items are frequently charged to a fire which could not be supported in court because the responsible party should not be expected to pay for them, e.g., the full replacement cost of tools and equipment lost or worn out on the fire. The only legitimate charge against the trespasser for such losses is the reasonable worth at the time it was put on the fire of equipment lost through no fault of the forest officers, or damaged or worn beyond repair. In many cases the full value of all small line and camp equipment can be established and 10% of the value estimated as depreciation, in which case all replacement costs would be eliminated. Operation expenditures or rental charges for motor equipment, which cover operation, repair, and depreciation are legitimate and can be defended in court if necessary. Care should be taken not to include the value of any subsistence or other expendable supplies left over from the fire or the value of any new equipment purchased and charged to the fire. To make a proper cost statement, the reporter cannot merely take figures from accounting records. He must go over the vouchers, inventories, Forms AD-108, and any other pertinent records, so as to make sure that nothing is overlooked and that every item he includes can be definitely shown to be legitimate.

Suppression costs should be summarized as indicated in paragraph 12 of the outline with the addition of "Miscellaneous," if desirable, to cover such charges as telephone tolls. All supplies in connection with transportation should be included under that heading rather than "other supplies," e.g., horse feed, gasoline and oil for trucks and cars (but not for fire line tractors and pumps), rentals of pack stock and all other transportation equipment, materials for airplane packaging, etc. It is desirable to show salaries of forest officers separately from their expenses. Salaries should check with pay rolls for the period the men worked on the fire.

Steps should be taken early to get charges incurred by other forests and the Portland warehouse, so that the report will not be unduly delayed for lack of complete cost data. As soon as it is known that a trespass report will have to be made, the Portland Supply officer and all forests incurring expenses against the fire should be informed and requested to furnish complete information in accordance with these instructions as early as possible. (See Forest Service Manual, FC-D3-2b, and Chapter 4, Part III, of this handbook as to account procedure in fire trespass cases.)

For the information of the regional forester in reviewing the cost figures, a detailed breakdown of the summarized costs should be given in a separate statement forwarded with the report. Only one copy of this statement need be furnished. It should show costs by appropriations and should not be merely a list of vouchers, as this is meaningless. Labor need not be itemized. Subsistence need not be itemized, but any credit for left-over supplies should be shown, and if the subsistence cost appears high in proportion to labor and salaries, it should be explained. Other supplies, which includes equipment charges not relating to transportation, should be broken down in sufficient detail for checking as to legitimacy of charges, and any credits.

should be indicated. Transportation should be detailed as to rentals of Government and private trucks, and other charges. Miscellaneous charges should be itemized. Names of forest officers and dates worked should be listed. It is a good plan for the reporter to make an itemized statement as a basis for his summary to be included in the report.

Witnesses: Although affidavits and signed statements will contain what the signers will presumably testify to, if called, it is desirable to list every government witness and summarize his probable testimony under this caption for the benefit of reviewers, particularly attorneys. Information as to the probable defendant's witnesses and their testimony is, of course, valuable in judging whether or not a suit could be won. It is important to keep track of government witnesses outside the Forest Service if the case is at all likely to come to trial.

Action Taken and Recommendations: Action taken by the investigator relates particularly to criminal cases, but if there is anything on this subject not brought out elsewhere in a report on a civil case, it should be shown here.

The reporter's recommendations should be clear-cut and the reasons for them should be summarized. They should relate to the trespasser's responsibility and the evidence. Dropping the case or accepting less than the full amount of the claim should not be recommended out of sympathy for the trespasser or because he is a good cooperator. Extenuating circumstances, however, may be stated under caption C, and if desirable, more fully explained in a letter transmitting the report.

If the supervisor does not agree with the reporter's recommendations he should either discuss the matter with him and reach an agreement as to the recommendations to be made or add his own recommendations with the reasons therefor. The report should be signed by the officer who prepared it and approved by the supervisor or acting supervisor.

Attachments: In addition to affidavits and other statements of witnesses and the map, copies of all notices issued to responsible parties, their written statements, forest officers' memoranda, and any other pertinent papers should be attached. Not only notices to control fire, but notices to dispose of a hazard or to take preventive precautions should be included if applicable. Where form notices, such as Form 11-R6, or other attachments are smaller than letter size it is well to paste them to letter-size sheets. Illegible carbon copies of notices should not be attached to the copies of the report; instead, copies for this purpose should be typed.

Map: A letter-size sheet should be used for the map if practicable. If not, the dimensions of the sheet should be such that it will fold to letter size for binding in with the report. In addition to the items listed in the outline, the map should show protective status of private lands in and adjacent to the fire area, the exterior boundary and point of origin of the fire, cover types, including slash areas with time slash was created,

and any other details which the reporter considers needed. The map should be signed and dated and should have a clear legend. When desirable acreage data in addition to the area of the fire should be given. By making a good map it is often possible to reduce the volume of the report, which is an advantage to both the reporter and the reviewers.

Liens: See regional instructions in the Forest Service Manual, NF-M2. In Oregon, liens may be filed to collect fire fighting costs under certain conditions (Sec. 107-212). In Washington, they may be filed for this purpose *-(Secs. 76.04.370 and 76.04.380)-* and also to recover necessary expense incurred in abatement of slash hazards *-(Sec. 76.04.390)-*.

If it is desired to file a lien in a supervisor's fire trespass case, or to recommend it in a larger case, the provisions and restrictions of the law and the following points should be studied. A sample lien is given in the Appendix.

- 1. The lien must be filed in the county where the land is located; if in two or more counties, a lien should be filed in each.
- 2. Section *-76.04.370-*, Washington, authorizes a lien only on the property where the work was performed. The Oregon section is more broadly worded and no doubt other property belonging to the owner of the land where the fire is burning uncontrolled can be included in the lien. This is unquestionably true under Section *-76.04.370-*, Washington, but there is some question whether the Forest Service can collect on a lien under this section.
- 3. Liens under Section *-76.04.370-*, Washington, must be signed by the state supervisor of forestry. Under the Oregon section they may be signed by a forest officer over his title of state warden.
- 4. Liens must be filed within 90 days from the time the last work was performed. It is doubtful if this would apply to the last day of a lengthy patrol by one or two men.
- 5. In Oregon liens must be foreclosed within six months from the filing date, and notice of intention to foreclose must be given the owner at least seven days before foreclosure proceedings are begun. In Washington foreclosure suit must be commenced within eight months from the filing date and prosecuted to judgment within two years.

6. A lien should never be filed until every reasonable effort has been made to effect voluntary settlement. If it is desired to recommend filing a lien in a regional forester's or larger case, the report must be forwarded in plenty of time for its review and the preparation and filing of the lien before the statutory limit expires.

R-6 F.C. Hdbk. *Amended ***Deleted 3-11-54 No. 82

- 7. If a lien is filed in a supervisor's case and settlement is not made within six weeks, two copies of the lien, completed as to date of filing and reference to page and book in which recorded, should be sent to the regional forester. Any liens prepared in other cases will be sent the supervisor for filing and the date of filing and record data should be reported to the regional forester immediately after filing.
- 8. Where a lien is filed and foreclosure becomes necessary, the regional forester will give the required notice to the trespasser through the supervisor, and will request the state forester to foreclose the lien.
- 9. While the statutes do not require notice to the property owner that a lien has been filed, it is desirable to furnish him a copy, completed as to filing data. This will make him liable if he disposes of the property before foreclosure proceedings are initiated.

APPENDIX

Federal Laws Not Given in Forest Service Manual

Authority of forest officers to enforce Federal laws and regulations, Acts Feb. 6, 1905 (33 Stat. 700) and March 3, 1905 (33 Stat. 873).

"All persons employed in the forest reserve and National Park Service of the United States shall have authority to make arrests for the violation of the laws and regulations relating to the forest reserves and national parks, and any person so arrested shall be taken before the nearest United States commissioner, within whose jurisdiction the reservation or national park is located, for trial; and upon sworn information by any competent person any United States commissioner in the proper jurisdiction shall issue process for the arrest of any person charged with the violation of said laws and regulations; but nothing herein contained shall be construed as preventing the arrest by any officer of the United States, without process, of any person taken in the act of violating said laws and regulations."

Authority of justices of the peace and other officers in Federal cases, (Sec. 1014, U. S. Rev. Stat.)

"For any crime or offense against the United States the offender may, by any justice or judge of the United States, or by any commissioner of a circuit court authorized to take bail, or by any chancellor, judge of a supreme court, chief or first judge of common pleas, mayor of a city, justice of the peace, or other magistrate of any State where he may be found, and at the expense of the United States, be arrested and imprisoned, or bailed, as the case may be, for trial before such court of the United States as by law has cognizance of the offense. Copies of the process shall be returned as speedily as may be into the clerk's office of such court, together with the recognizances of the witnesses for their appearance to testify in the case. And where any offender or witness is committed in any district other than that where the offense is to be tried, it shall be the duty of the judge of the district where such offender or witness is imprisoned seasonably to issue, and of the marshal to execute, a warrant for his removal to the district where the trial is to be had."

Conspiracy, Act of March 4, 1909 (35 Stat. 1096).

"Sec. 37. If two or more persons conspire either to commit any offense against the United States, or to defraud the United States in any manner or for any purpose, and one or more of such parties do any act to effect the object of the conspiracy, each of the parties to such conspiracy shall be fined not more than ten thousand dollars, or imprisoned not more than two years, or both."

Perjury, Act of March 4, 1909 (35 Stat. 1111).

"Sec. 125. Whoever having taken an oath before a competent tribunal officer, or person, in any case in which a law of the United States authorizes an oath to be administered, that he will testify, declare, depose,

or certify truly, or that any written testimony, declaration, deposition, or certificate by him subscribed is true, shall wilfully or contrary to such cath state or subscribe any material matter which he does not believe to be true, is guilty of perjury, and shall be fined not more than two thousand dollars and imprisoned not more than five years."

Sample Law Enforcement Forms

AFFIDAVIT

STATE	OF ss.	The State of the		
COUNTY	OF)			
	John Doe, of	,	PALINE HELD	_, being first
duly s	worn, deposes and says:			
Section of the sectio				
		(Signed)	John Doe	
	Subscribed and sworn to before	e me at		3
this _	day of	, 19		
			Justice of	the Peace

NOTES: See pages 9 and 10 of this chapter as to officers authorized to administer oaths in criminal cases, and as to statements of accused or suspected persons.

The formal beginning indicated above is not absolutely necessary. Regardless of its form, a signed statement becomes an affidavit when sworn to before a proper official.

If a signed statement is not sworn to, the Forest Officer should sign as witness. More than one witness is desirable to statements by accused or suspected persons or hostile witnesses.

COMPLAINT

In Justice Court for	Precinct, _	County,
State of		
THE STATE OF	Complaint	
The above named defendant	, John Doe, of	County,
State of, is a	ccused by this compla	int of the crime of
(a) (b)	(c), commi	tted as follows, to-wit
The said defendant, John	Doe, in the County of	,
State of, on t	he day of	, A.D. 19,
then and there being, did then a	nd there (d)	(e)
(f) contrary to the s	tatutes in such cases	made and provided,
and against the peace and dignit	y of the State of	Construction Const
THE STREET OF STREET OF STREET	State Fire Ward (or State Range	den - Complainant.
Reverse Si	de of Complaint	
STATE OF		
COUNTY OF		
I,	, being first du	aly sworn, say that I
am the State Fire Warden (or Sta	te Ranger) in the abo	ove entitled action,
that I know the contents of the	foregoing complaint,	and that the same is
true, as I verily believe.		
	State Fire Warden (or State Ranger)	- Complainant

	Subscribed	and	BMOLU	to	before	me	this	and the state of t	day	of	9
19											
					10 -						

Justice of the Peace

Illustrative Wording in a Complaint Form

The letters (a), (b), etc., in the blank spaces in the above form refer to the illustrative wording given below. However, these examples should not be followed verbatim unless they fit the individual cases. The complaint should state the facts and follow the language of the statute violated.

- (a) Throwing away lighted material, in violation of Section 107-228, Oregon Compiled Laws Annotated.
- (b) Burning forest material during the closed season without a permit in violation of Section 5788, Remington Revised Statutes, as amended.
- (c) Leaving a campfire burning on land not his own, in violation of Section 107-213, Oregon Compiled Laws, Annotated.
- (d) Throw away a lighted cigarett during the closed season on forest lands, to wit: the SE of SE, Section 12, T. & S., R. 6 E., W.M.
- (e) Set fire to a slashing, without first obtaining permission in writing from the State Supervisor of Forestry, or a warden, or a ranger, on his own land, described as follows: NW2 of SW2, Section 9, T. 24 N., R. 4 W., W. M.
- (f) Leave a campfire burning upon departing from a camping place on land not his own in the BM of SW, Section 24, T. 13, S., R 3 E., W. H.

POWER OF ATTORNEY - Criminal Cases

			(Place)	(Date)
		· Age chart	era Cira for Adelesa - Compressor de	
I, John Do	oe, of		, of	,
do hereby authori	ize and appoint			
my attorney in fa	act, to appear	before any	court or magis	trate having juris-
diction of the of	ffense, and for	me and in	my name to ent	er a plea of guilty
to the charge of	(a)	(b)	(c)	. The facts
are as follows:	(d)	(e)	(f)	•
	Witness my har	nd and seal		
		(Signed)	John Doe	(SEAL)
Witnesses:				

Illustrative Wording in a Power of Attorney Form

For (a), (b), and (c), see illustrative wording under complaint form. The facts, (d), (e), (f), should include the date. For example, in a power of attorney, the facts as given under (d) for the complaint form would read, "On the ____ day of ____, 19___, I threw away a lighted cigarette on forest lands in the SE of SE, Section 12, T. 4 S., R. 6 E., W.M."

NOTICE OF CLAIM OF LIEN

STATE OF, Claimant	
VS.	
JOHN DOE	
Notice is hereby given that on the State of, by and through the State of, by and through the forest Service, commenced to perform the fighting of fire upon the (Legal Substitution of fighting of fire upon the (Legal Substitution of State of, North, Range the County of, State of, or reported owner, is John Doe, of, formance of said labor and incurring of, and ninety days have said labor performed and expense incur dollars (\$), and was expended on the, and of, fail to make every reasonable effort that for labor performed and expense in the for labor performed and expense in the for labor performed and expense in the	Labor and to incur expense in the division) East, Willamette Meridian, in , of which property the owner, ; that the peof expense ceased on the day of we not elapsed since that time; that erred was of the value of the lands above described; that said on of said land, had knowledge of 19 , and did refuse, neglect, and to control and extinguish the same; incurred the undersigned claims a ed for the sum of dollars an paid; that the amount claimed is
Justiy due, and what where are no cred	it os of offsets.
SI	CATE OF
By	
	(title)
Post Office Address	
STATE OF	oregoing Claim of Lien and know
Subscribed and sworn to before	me this
	of
My commission expires	_, 19

NOTE: In Oregon, a claim of lien may be signed by the State Forester or by a state fire warden. In Washington (Section 216), it must be signed by the State Supervisor of Forestry. The proper title should be used after the signature and in the jurat.

FIRE CONTROL HANDBOOK REGION 6



PART I PREVENTION

CHAPTER 4
PREVENTION METHODS

FIRE CONTROL HANDBOOK
REGION 6

PART I

PREVENTION

CHAPTER 4

PREVENTION METHODS

PART I - PREVENTION - Chapter 4

PREVENTION METHODS

Table of Contents

		Page No.
Forest Ind	strial Operations	
Suggestions	s for Making Examinations.	I-U-1
List of Fine I. II. III. IV. V. VII. VIII. IX. XII. XII	Permits	Sawmills - Oregon
	Permits	Logging and Clearing Operations —
XII. XIV. XV. XV. XVI. XVII. XIX. XXX. XX	Smoking	

Table of Contents (Cont'd.)

		Page No.
List of Fi	ire Protection Measures for Sawmills - Washington	I-4-13
I. III. IV. V. VI. VII. VIII.	Tools Required for Mills Water Supply Spark Arresters. Mill Waste Disposal. Trucks. Tractors (Gas and Diesel) Smoking Watchman. Cleanup	I-4-13 I-4-14 I-4-14 I-4-14 I-4-14 I-4-14 I-4-15 I-4-15
	ire Protection Measures for Logging and Clearing Operat	
I. II. III.	Permits	I-4-16 I-4-16 I-4-17
IV. V. VI.	Watchman Requirements	I-4-17 I-4-17 I-4-17
VII. VIII.	Trucks	I-4-17 I-4-17
X. XI.	Steam Logging Engine or Boiler	I-4-18 I-4-18 I-4-18
XII. XIV.	Lines	I-4-18 I-4-19 I-4-19
XV. XVI.	Weather Instruments	I-4-19 I-4-19 I-4-19
XVIII.	Other	I-4-19 I-4-19-*

PREVENTION METHODS

Forest Industrial Operations

Planned, periodic inspection with written record of logging, sawmill, or other forest industrial operations is necessary to assure that the operator:

- l. Will prevent the start of fires from defective equipment or faulty practices.
- 2. Will achieve quick control of any fire that starts, by having adequate equipment and other facilities available and properly located.

To attain these overall objectives it will be necessary for the inspecting officer to:

- * 1. Examine for lack of or faulty spark arresters on each piece of spark-emitting equipment, such as gasoline or diesel engines, sawmill boilers, trucks, tractors, power saws and other logging engines. *
- 2. Inspect tools and equipment to determine if the condition is satisfactory, the number is sufficient, and the distribution is proper for the most effective use to meet the probable need within legal limits.
- * 3. Examine other fire precautionary measures, as watchman, patrolman, clearing, snag falling, etc., to determine if the requirements are being satisfactorily met. *
- 4. Determine if the operator and his employees have a definite plan (preferably in writing) of action for attacking a fire and if each man knows what he is to do.

Suggestions for Making Examinations

Regular inspections should be made in company with the operator or his designated representative. If possible, a date for the inspection should be prearranged by the forest officer and operator.

Before making the inspection, the forest officer should obtain all available information relating to the operation. This might include such items as type and size of operation, number of employees, characteristics of operator, previous agreements or disagreements between operator and inspecting officer, fire record of the operation, and any special stipulations which have been included in timber sale or other contracts not covered by state laws.

Forest officers will vary in their methods of inspecting industrial operations, but all should adopt an approach which will synchronize smoothly and effectively with the personality of the man with whom they deal. The method of approach will depend largely on the knowledge of existing conditions which the forest officer possesses. The inspection should be conducted in a friendly, unassuming manner so both parties will feel at ease. This will assure the least possible opportunity for friction to develop, which is not only disagreeable but often blocks progress.

The first duty of the inspecting officer, and one of the most important, is to gain the confidence and respect of the operator or his designated representative. This can be accomplished by "talking his language," discussing his problems, knowing the job, and not being officious. First impressions often spell the difference between success or failure.

The inspecting officer should make constructive suggestions and requests, being careful not to overlook opportunities to give recognition and praise for good practices which are observed. This helps to strengthen cooperation between the operator and the Forest Service, which is instrumental in gaining the objective.

If a deficiency is discovered, such as a faulty spark arrester, discuss it with the company representative and point out the reason why correction is necessary to assure safe practice. A definite date (in some cases "at once") should be agreed upon, and put into writing (Form 120-R6 or appropriate state form) for the correction of each deficiency. The operator should first be requested, not threatened, to make the correction. If this method fails, the procedure will be as outlined in Part I, Chapter 3, of the Fire Control Handbook, and the State Forestry Laws. Prompt follow-up should be made to see that faults are corrected. The forest officer has a definite responsibility to see that deficiencies which constitute a hazard are not permitted to exist. *

For details on laws and regulations and law enforcement, the following should be studied and referred to:

In Oregon:

1. Oregon Forest Laws

2. Field Inspector's Handbook

In Washington: Forestry Laws of the State of Washington

Both States:

1. Part 1, Chapter 3, Fire Control Handbook
2. Pages 57 to 65, Part I, Chapter 2, Fire Control Handbook

3. Timber Sale Contracts and Agreements 4. Clearing Contracts, Agreements or Stipulations

The forest officer should keep his objectives in mind and work toward them at all times, conduct the job in an impersonal manner, and not mention the word "law" any oftener than necessary. The following list of fire protection measures and report forms has been prepared for use by inspecting officers. These measures should be studied and thoroughly understood before visiting an operation.

Appropriate descriptive units, "List of Fire Protection Measures for ", should be available for use in the field by inspecting officers. Those in Oregon will not need Washington lists and vice versa. Appropriate report forms will be needed each time a field examination is made. Inspection of private operations within the Forest Service protection boundary in Oregon will use Oregon State Form 21-A and in Washington will use Washington State Form 4667 for inspection of fire equipment and the Supplemental Inspection

Form for inspection of steam logging engines, boilers and logging locomotives. Use Forest Service Form 120-R6 when making Equipment Inspection, National Forest Timber Sales. Forest Service report forms never should be sent to State Foresters.

Forest officers should make full use of State Field Inspectors Handbooks for instructions and guidance when enforcing State Fire Law on private lands within the Forest Service protection boundary. A complete and systematic file should be maintained in the district ranger's office of all equipment inspections for follow-up reference and possible law enforcement action.

LIST OF FIRE PROTECTION MEASURES FOR SAWMILLS

Oregon

(All items required under State Law or Regulation except those designated "Good Practice.")

I. PERMITS (107-254, O.C.L.A.)

All mill operators must obtain a written permit to operate any powerdriven machine on or within one-eighth mile of forest land during any part of the year.

II. FIRE FIGHTING EQUIPMENT (107-216 *-and 107-217-*, O.C.L.A.)

- 1. Everyone conducting a mill operation within one-eighth mile of any forest land shall maintain during the closed season: sufficient tools in a box to equip the entire mill crew for fire fighting; tools to consist of shovels, hazel hoes, axes, water buckets, pump cans and such other tools as specified by the State Forester, Warden, or Ranger; provided, however, that the minimum number shall not be less than 4 nor the maximum number more than 100 exclusive of felling and bucking tools.
- *-2. Portable pumps and hose: During the closed season, when in the judgment of the Forester any logging or sawmill operation has a fire hazard requiring additional fire protection facilities, the logging or sawmill operator shall, upon written notice from the Forester, provide in the operation area one or more portable pumps of a size and capacity with attachable hose of length, diameter and capacity as specified in the notice as necessary to safeguard the operation area from fire; provided, water for such designated pump and hose is available in the operation area.
- 3. Water barrels: During the closed season, when in the judgment of the Forester any sawmill operation located where gravity or pressure water systems are unavailable constitutes a fire hazard requiring special fire protection, the sawmill operator shall, upon written notice from the Forester, provide in the operation area barrels of at least fifty (50) gallons capacity filled with water with not less than one two-gallon bucket at each barrel; the number of barrels and the location of each barrel shall be as specified in the notice.-*

Good Practice: Tools to be kept in a sealed box and used only for fire suppression.

III. ENGINES, STEAM (Other than common carriers)(107-214, 107-215, *-107-217-*, O.C.L.A.)

Required during closed season when operating within one-eighth mile of any forest land:

1. An adequate spark arrester kept in constant use and repair except that the State Forester may waive the provision on oil-burning steam engines when exhausts are located outside of the smokestack.

- 2. Ash pan adequate to prevent the escape of fire.
- 3. If any steam *-or internal-combustion-* engine is operated during the closed season within 300 feet of any inflammable debris on any forest land, there *-shall be provided at each engine setting:-*
- a. An efficient *-pressure-* pump or gravity water system, either of which shall be of sufficient size and capacity to give not less than 40 pounds' pressure on 500 feet of hose, one inch or over.
- b. Not less than 500 feet of hose, one inch or larger, with nozzle not less than $1/l_1$ -inch in diameter.
- c. An engine operated within 150 feet of another engine, properly equipped with pump or gravity water system and having at least 500 feet of hose one inch or larger and equipped with nozzle not less than $1/l_l$ inch in diameter, will be exempt.

Good Practice:

- 1. Note: 40 pounds of pressure should in interpreted to mean at the nozzle. A discharge of 10 gallons or more per minute through this length of hose and 1/4-inch size nozzle meets the requirements.
- 2. 300 gallons of water on hand at all times for emergency use with power pump.
- 3. If possible, check spark arresters at night under pull. Walk around smokestack and look up its sides while in operation. If large particles are escaping, they will show up against the sky.

IV. ENGINES, GAS OR DIESEL (107-214 and *-107-215-*, 0.C.L.A.)

Required during closed season when operating within one-eighth mile of forest land.

- 1. Spark arrester kept in constant use and repair. (State Forester may waive.)
 - 2. A fire extinguisher of not less than $1\frac{1}{2}$ -qt. capacity.

Good Practice: Barrel of sand with short-handle R.P. shovel at stationary engines.

<u>V. TRACTORS</u> (107-214, O.C.L.A.)

Required during closed season when operating within one-eighth mile of forest land:

- 1. A fire extinguisher of not less than $1\frac{1}{2}$ -qt. capacity.
- 2. Adequate spark arrester unless waived by State Forester.

*Amended 6-17-53

R-6 F. C. Hdbk.

No. 75

VI. TRUCKS (107-216, O.C.L.A.)

During closed season each truck transporting forest products over forest roads shall be provided with the following equipment to be kept in constant repair and readiness for instant use:

- 1. A shovel.
- 2. An axe.
- 3. A fire extinguisher of not less than $1\frac{1}{2}$ -qt. capacity.
- 4. Adequate spark arrester (an efficient muffler in good condition meets this requirement). (State Forester may waive provisions.)

VII. WATCHMEN (107-219, O.C.L.A.)

Anyone operating stationary power-driven equipment in or within 150 feet of any forest land shall during the closed season provide: a competent watchman constantly on duty until 8 p.m. each operating day and under no conditions can such watchman service be less than 3 hours' duration after the equipment has been shut down for the day.

Good Practice: Additional watchmen should be on duty during periods of extremely low humidity.

VIII. SNAGFALLING AND CLEANUP (107-218 and 107-219, 0.C.L.A.)

- l. During the closed season it shall be unlawful to operate any stationary power-driven equipment within 150 feet of any forest land unless ground for a distance of 50 feet around such equipment is cleared of all inflammable debris, or is kept sufficiently moist to prevent the starting of fires. *Forester may waive clearing of debris and moistening of the ground.-*
- 2. All snags over 15 feet in height, within 200 feet of any steam engine setting in any forest land, shall be felled before engine is operated.

IX. WEATHER INSTRUMENTS (107-254, O.C.L.A.)

Operators west of the Cascade summit are required to furnish and maintain weather instruments as prescribed by the State Forester to determine humidity, temperature and direction of wind when operating within one-eighth mile of forest land.

Good Practice: Large operations should have a hygrothermograph and all small operations a hygrometer or sling psychrometer. Both hygrothermograph and hygrometer should be checked frequently for accuracy with the psychrometer.

X. CLOSING DOWN OPERATIONS (107-252, O.C.L.A.; *-Reg. VI-*)

During the closed season or any extension thereof when conditions are bad and the State Forester shall issue or cause to be issued notices to that effect, the use of fire in any form except for fire control under the supervision of the State Forester, or the use of any power-driven equipment is unlawful on forest lands west of the Cascade summit for period or periods he specifies.

*Amended 6-17-53 R-6 F. C. Hdbk. No. 75 Regulation *-VI-*: Any operator holding a permit required by section 107-254 shall, after notice of order by the State Forester to close down operation activity, comply with the orders as follows:

- 1. The following types of operation activity shall close down during the period of order:
 - a. All mills with open refuse fires.
- b. All mills in hazardous locations not having adequate fire-prevention facilities.
- 2. On approval of the Forester, the operation activity shall be permitted to run during close down period of the order under the following conditions:
- a. All mills having closed burners and adequate fire-protection facilities.
- b. All mills where no mill refuse is burned and adequate fire protection facilities are maintained and the mill area has been approved by the Forester.
- *-c. All mills hauling lumber, forest products or equipment on public roads or forest roads through non-hazardous areas.-*

NOTE: The "Close Down Order" of the State Forester is pursuant to the terms and conditions of the operation permit required by section 107-254, O.C.L.A. The permit remains in effect during the period of the order; however, the operation activity designated under "1" in Regulation *-VI-* is closed down. The operation activity under "2" of the regulation may continue on approval of the Forester and under the conditions cited.

XI. MILL WASTE DISPOSAL (*-Chapter 281, Oregon Laws, 1925)

Section 16:

- l. Any one operating a mill or plant from which refuse is burned in or within one-eighth of one mile of forest land shall provide and maintain a closed refuse burner of a type and size which, in the judgment of the forester is adequate to prevent the spread of fire, unless the forester specifies other measures in lieu thereof as equally adequate to prevent the spread of fire. The ground around the mill or plant, including the required refuse burner, shall be cleared for a distance of not less than 200 feet unless in the judgment of the forester a lesser distance shall be specified.
- 2. Any one operating a mill or plant, for the prefabrication or manufacture of forest products from which refuse is disposed of in forest land without burning, shall clear the ground around the mill or plant for a distance of not less than 200 feet, unless in the judgment of the forester a lesser distance shall be specified. The forester, during the closed season, shall require a cleared fire line around such refuse which in his judgment is adequate to reduce fire hazard conditions.-*

XII. SMOKING (107-228 and 107-210, 0.C.L.A.)

For all forest land, private road, public highway or railroad right-of-way, the law prohibits throwing away any lighted material *-at any time-*.

Good Practice:

- 1. Prohibit smoking around mills except in places designated safe by the Mill Superintendent.
 - 2. No smoking while traveling on any conveyance or when at work.

XIII. STORAGE OF INFLAMMABLES

Good Practice:

- 1. Explosives should be stored away from the immediate operating area and at least 300 feet from any other building.
 - 2. Powder and caps should be stored separately.
- 3. Gasoline and oil should be stored at least 30 feet from any other building and in the shade.
- 4. Inflammable debris should be eliminated for a radius of at least 30 feet.

XIV. OTHER

Good Practice: Use State Form 21, Sawmill Operation Inspection Report, when making inspections.

Oregon

(All items required under State Law or Regulations except those designated "Good Practice.")

The regulations shall be effective during the closed season *-(April 1 to December 31)-* of any year or any advancement thereof as provided for in section 107-209, O.C.L.A.; such regulations shall apply to the forest land or land within one-eighth mile of such forest land under the jurisdiction of the State Forester or the State Board of Forestry and to any activity thereon unless exception is made in the particular regulation.

The following words and phrases, when used in the regulations, shall have the meaning ascribed to them unless the context clearly would be otherwise:

Fire Protection District: shall mean and include any district designated by the State Forester, under the authority of the State Board of Forestry, to administer and enforce laws pertaining to fire protection.

Forester: shall mean and include the State Forester as provided by law or his designated representative or employee.

Operation: shall mean and include any industrial activity or development.

Operator: shall mean and include any person, firm or corporation responsible for an operation or unreleased slash area.

Unreleased Slash Area: shall mean and include any area on which an operation has been conducted and not released by the State Forester pursuant to section 107-222, 0.C.L.A.

I. PERMITS (107-254, O.C.L.A.)

All logging operators must obtain a written permit to operate any power-driven machine on or within one-eighth mile of forest land during any part of the year.

II. FIRE FIGHTING EQUIPMENT (107-216, O.G.L.A.)

Everyone conducting a *-mill or woods-* operation within one-eighth mile of any forest land shall maintain during the closed season: sufficient tools in a box to equip the entire woods *-and/or mill-* crew for fire fighting; tools to consist of shovels, hazel hoes, axes, water buckets, pump cans, and such other tools as specified by the State Forester, Warden, or Ranger; provided, however, that the minimum number shall not be less than 4 nor the maximum number more than 100 exclusive of felling and bucking tools *-for each woods or mill operation. When 2 or more pieces of

Amended 6-17-53 R-6 F. C. Hdbk. No. 75 power-driven equipment are used at a landing or side and such equipment is in excess of 600 feet distant from another piece of such equipment, tool boxes and tools will be provided at each piece of equipment.-

Good Practice: Tools should be kept in a sealed box and used only for fire suppression.

III. ENGINES, STEAM, *-GAS, OR DIESEL-* (Other than common carriers)

Required during closed season when operating within one-eighth mile of any forest land:

- 1. An adequate spark arrester kept in constant use and repair except that the State Forester may waive the provision on oil-burning steam engines when exhausts are located *-outside-* of the smokestack.
 - *-2. A fire extinguisher of not less than l_2^1 -qt. capacity.-*
 - 3. Ash pan adequate to prevent the escape of fire.
- 4. If any steam *-or internal combustion-* engine is operated during the closed season within 300 feet of any inflammable debris on any forest land, there must be provided *-at each engine setting-*:
- a. An efficient **** pump or gravity water system, either of which shall be of sufficient size and capacity to give (not less than) 40 pounds' pressure on 500 feet of hose, one inch or over.
- b. Not less than 500 feet of one-inch or larger hose with nozzle not less than 1/4 inch in diameter.
- c. An engine operated within 150 feet of another engine properly equipped with pump or gravity water system and having at least 500 feet of one-inch or larger hose and equipped with nozzle not less than $1/l_{\rm p}$ -inch in diameter, will be exempt.

Good Practice:

- 1. Note: 40 pounds of pressure should be interpreted to mean at the nozzle. A discharge of 10 gallons or more per minute through this length of hose and 1/4-inch size nozzle meets the requirements.
- 2. 300 gallons of water on hand at all times for emergency use with power pump.
- 3. If possible, check spark arresters at night under pull. Walk around smokestack and look up its sides while in operation. If large particles are escaping, they will show up against the sky.
 - 4. A barrel of sand with short-handle R.P. shovel at stationary engines.

*Amended and ***Deleted 6-17-53 R-6 F. C. Hdbk.

IV. TRACTORS (107-214, 0.C.L.A.)

Required during closed season when operating within one-eighth mile of forest land:

- 1. A fire extinguisher of not less than $1\frac{1}{2}$ -qt. capacity.
- 2. Adequate spark arrester unless waived by State Forester.

Good Practice: One short-handle R.P. shovel.

V. TRUCKS (107-216, 0.C.L.A.)

During closed season each truck transporting forest products over forest roads shall be provided with the following equipment to be kept in constant repair and readiness for instant use:

- 1. A shovel.
- 2. An axe.
- 3. A fire extinguisher of not less than l_2^1 -qt. capacity.
- 4. Adequate spark arrester (an efficient muffler in good condition meets this requirement). (State Forester may waive provisions.)

*-VI. WATCHMEN (107-219, O.C.L.A.)

Anyone operating stationary power-driven equipment or any power-driven logging equipment or any power-driven equipment used in a stationary manner in or within 150 feet of any forest land unless the ground for a distance of 50 feet around such equipment is cleared of all inflammable debris, or is kept sufficiently moist to prevent starting of fires and every such operator shall, during said closed season provide watchmen service on his operating area which, in the judgment of the forester, is adequate for the condition existing and unless specifically modified by the forester, said watchman service shall consist of not less than one competent man for each logging side or mill, who shall be constantly on duty until 8 p.m. each evening on every day said equipment is operated; and provided that under no condition shall such watchman service be of less than 3 hours duration after shut-down. Forester may waive clearing of debris and moistening of ground whenever in his judgment, the operation is not of sufficient duration to justify such action.-*

Good Practice: Additional watchmen should be on duty during periods of extremely low humidity.

VII. SNAGFALLING AND CLEANUP (107-218 and 107-219, 0.C.L.A.)

l. During the closed season, it shall be unlawful to operate any stationary power-driven equipment *-or any power-driven logging equipment or any power-driven logging equipment used in a stationary manner-* within 150 feet of any forest land unless ground for a distance of 50 feet around such equipment is cleared of all inflammable debris or is kept sufficiently moist to prevent the starting of fires.

- 2. All snags over 15 feet in height within 200 feet of any *-logging-* engine setting on any forest land shall be felled before engine is operated.
- 3. On forest land west of the summit of the Cascades and including all Hood River County, all snags over 25 feet in height and 16 inches in diameter shall be felled currently with the felling of the live merchantable timber on areas where all or substantially all of the merchantable timber is cut; provided that on areas where timber has been killed prior to logging by fire, insects, or windthrow, the number of snags required to be felled per acre shall not exceed the average number of snags per acre on areas of live merchantable timber in the same county.

VIII. WEATHER INSTRUMENTS (107-254, O.C.L.A.)

Operators west of the Cascade summit are required to furnish and maintain weather instruments as prescribed by the State Forester to determine humidity, temperature, and direction of wind when operating within one-eighth mile of forest land.

Good Practice: Large operations should have a hygrothermograph and all small operations a hygrometer or sling psychrometer. Both hygrothermograph and hygrometer should be checked frequently for accuracy with the psychrometer.

IX. CLOSING DOWN OPERATIONS (107-252, O.C.L.A.)

During the closed season or any extension thereof when fire conditions are bad and the State Forester shall issue or cause to be issued notices to the effect that use of fire in any form except for fire control under the supervision of the State Forester or the use of any power-driven equipment is unlawful on forest lands (west of the Cascade summit *-including all of Hood River County-*) for the period or periods he specifies.

Regulation *-VI-*: The following regulation concerning relative humidity and high wind shall apply to any operator holding a permit under section 107-254, 0.C.L.A., except, such regulation shall not apply to such operator if the operation is located in any part of the area *- in Close-Down Zone 16, or the area east of the summit of the Cascade Range:-*

- 1. The operator shall close down the operation during any day or part thereof for the period of time that the relative humidity is thirty (30) per cent or lower in the operation area unless written permission to continue such operation is given to the operator by the Forester.
- 2. The operator shall close down the operation during any day or part thereof for the period of time that high wind prevails over the operation area and the relative humidity is thirty-five (35) per cent or lower in the operation area unless written permission to continue such operation is given to the operator by the Forester; high wind shall be considered as any continuous wind or air disturbance causing an increase in fire danger in the operation area.
- 3. The operator shall furnish and maintain an instrument for the accurate measurement of relative humidity in the operation area; the cost of such instrument need not exceed the sum of twenty-five (\$25) dollars.

*Amended 6-17-53 R-6 F. C. Hdbk. No. 75 4. The following types of operating activity shall close down during the period of orders:

a. Logging.

- (1) All yarding of logs.
- (2) All felling and bucking.
- b. Road construction and maintenance.
 - (1) All pioneering.
- (2) Road construction and maintenance with specified

exceptions.

c. Hauling and moving of forest products.

All hauling or moving of forest products or equipment through slash areas or other hazardous areas (not to affect the use of public roads).

d. Industrial operations.

Right-of-way clearings and other similar operations to be governed by Item c above when adaptable.

- 5. On approval of the Forester the operation activity shall be permitted to run during close-down period of the order under the following conditions:
 - a. Logging.
 - (1) Repair work on equipment in non-hazardous locations.

(2) Loading out in non-hazardous locations.

b. Road construction and maintenance.

- (1) Operation of rock crushers in pits.
- (2) Operation of bulldozers in pits or on mineral soil.

(3) Grading of roads in mineral soil.

- (4) Rocking of roads in approved safe areas.
- c. Hauling and moving.

Hauling of lumber, forest products or equipment on public roads or forest roads through non-hazardous areas.

d. Industrial operations.

Right-of-way clearings or maintenance and other similar operations shall be governed by the above regulations when adaptable.

Page Rewritten 6-17-53 R-6 F. C. Hdbk. No. 75

X. TANK TRUCKS (107-217, O.C.L.A.)

May be required of every logging operator, by State Forester upon 30 days' notice, who uses truck roads for the transportation of logs or other forest products.

- l. Tank truck or portable water tank of not less than *-200-gallon-* capacity equipped with an efficient power pump of a size to give not less than 40 pounds' pressure at a nozzle, 1/4 inch or larger in diameter, when attached to 500 feet of hose, one inch or larger, said pressure to be measured at pump level.
- 2. Not less than 500 feet of hose, one inch or larger in diameter, and nozzle not less than 1/4 inch in diameter.
- 3. Above equipment to be kept in constant readiness during fire season.
- 4. Operator may use above equipment for purpose of sprinkling roads or other uses within operating areas.
 - 5. Equipment specified for trucks (item V).

XI. TANK CARS (107-217, 0.C.L.A.)

May be required by State Forester upon 30 days! notice when logging operation is of sufficient size to justify additional protection from fire.

- l. Not less than 6000-gallon tank car equipped with an efficient power pump of size to give not less than 40 pounds' pressure at a nozzle, 1/4-inch or larger, when attached to 800 feet of hose, one inch or larger, said pressure to be measured at pump level.
 - 2. Not less than 800 feet of hose, one inch or larger.

Good Practice: Include a 1/4-inch nozzle with hose specified in #2 above.

XII. SMOKING (107-228, O.C.L.A. *-and Chapter 281, Oregon Laws 1952-*)

- l. For all forest land, private road, public highway, or railroad right-of-way, the law prohibits throwing away any lighted material during closed season.
- *-2. During the closed season smoking by any person on forest land shall be prohibited while such person is working in or traveling in or through any operation area.-*

*-XIII. BLASTING (Chapter 281, Oregon Laws 1925)

Section 14

- 1. During the closed season it shall be unlawful to use fuse and caps for blasting on forest land unless approval is granted by the Forester.
- 2. During the closed season it shall be unlawful to use explosives in the topping of trees in forest land unless approval is granted by the Forester.-*

XIV. POWER SAWS *-(Regulation V)-*

- l. Any fueling or refueling of a power saw shall be done in an area which has first been cleared of material which will carry fire; such power saw shall be moved at least 10 feet from the place of fueling before starting.
- 2. Any person operating a power saw shall have immediately available for the prevention and suppression of fire at least a fire extinguisher of 8 ounces minimum capacity and a shovel of three foot handle, both of the type approved by the Forester.

Good Practice:

- 1. Keep muffler on saw and in good condition at all times.
- 2. Keep engine wiped clean of sawdust.

XV. PORTABLE PUMPS AND HOSE *-(107-217, O.C.L.A.)-*

***When in the judgment of the Forester any logging or sawmill operation has a fire hazard requiring additional fire protection facilities, the logging or sawmill operator shall, upon written notice from the Forester, provide in the operation area one or more portable pumps of a size and capacity with attachable hose of length, diameter and capacity as specified in the notice as necessary to safeguard the operation area from fire; provided, water for such designated pump and hose is available in the operation area.

XVI. FIRE WARDEN FOR OPERATION AREA *-(107-204, O.C.L.A.)-*

Regulation *-II-*: When in the judgment of the Forester any operation area is of a size and fire hazard as to require special fire protection, the operator shall, upon written notice from the Forester, provide a person who is competent to operate all fire-protection equipment in the operation area and physically able to patrol the area; such person shall be a fire warden appointed under authority of section 107-204, O.C.L.A.

XVII. PATROLMAN FOR UNRELEASED SLASH AREA

Regulation *-III-*: When in the judgment of the Forester any unreleased slash area is of a size and fire hazard as to require special fire protection, the operator shall, upon written notice from the Forester, provide a competent and physically able patrolman for such area during periods of fire danger as designated in the notice.

XVIII. MAINTENANCE OF ROADS THROUGH UNRELEASED SLASH AREAS

Regulation *-IV-*: When in the judgment of the Forester any unreleased slash area is of a size and fire hazard as to require special fire protection, the operator shall, upon written notice from the Forester, maintain in a suitable condition all roads (exclusive of public roads) designated by the Forester through such area.

XIX. COMMUNICATION (107-254, O.C.L.A.)

- 1. Telephone communication from headquarters to the "outside".
- 2. If the State Forester so directs, a steam operator must furnish telephone communication between camps and the operating "sides" if the operation is large enough to justify.

XX. STORAGE OF INFLAMMABLES

Good Practice:

- l. Store explosives away from the immediate operating area and at least 300 feet from any other building.
 - 2. Store powder and caps separately.
- 3. Store gasoline and oil at least 30 feet from any other building and in the shade.
 - 4. Eliminate inflammable debris for a radius of at least 30 feet.

XXI. TAIL AND CORNER TREE EQUIPMENT

Good Practice:

- 1. Clear ground of inflammable material around tail and corner blocks.
- 2. Maintain 5-gallon backpack hand force pump filled with water at corner block.

XXII. OTHER

Good Practice: Use State Form 21-A, Logging Operation Inspection Report, when making inspections.

*Amended 6-17-53 R-6 F. C. Hdbk.

No. 75

LIST OF FIRE PROTECTION MEASURES FOR SAWMILLS

Washington

The equipment and provisions listed below are in accordance with the Washington State Law and apply to mills within one-fourth mile of any forest area. The requirements are the same for all mills, regardless of size. On national forest lands, forest officers will be guided by the stipulations in the Timber Sale Contract. Good practices are listed in Part I, Chapter 2 (Hazard Reduction) of the Fire Control Handbook, pages 62 to 65.

The State of Washington does not have a separate report for sawmills. Form 4667 "Fire Equipment Inspection" is used for both sawmill and logging inspections.

I. TOOLS REQUIRED FOR MILLS

1. For operations employing five men or less:

A sealed fire-tool box containing at least:

- (a) 2 axes
- (b) 3 shovels
- (c) 3 adze hoes

To be kept adjacent to the tool box:

- (d) 1 bucking saw with handles
- (e) 100 gallons of water or a five-gallon pump can of water
- (f) 2 buckets
- 2. For operations employing more than five men:

A sealed fire-tool box containing at least:

- (a) 3 axes
- (b) 6 shovels
- (c) 6 adze hoes

To be kept adjacent to the tool box:

- (d) 2 bucking saws with handles
- (e) 1 five-gallon pump can of water

II. WATER SUPPLY

If gasoline or diesel engine is used at a mill, one-hundred gallons of water and two buckets shall be provided.

III. SPARK ARRESTERS

Any smokestack, chimney, or other spark-emitting outlet of any powerproducing plant must have a safe and suitable device for arresting sparks.

IV. MILL WASTE DISPOSAL

The law requires place of burning be confined and surrounding areas properly safeguarded by such additional devices as the State Supervisor of Forestry may require. (Open burners require permits and are not permitted during the closed season.)

Good practice requires:

- 1. A completely enclosed and properly screened burner; or
- 2. Construction of fire trails around burner; and snags to be felled near burner.

V. TRUCKS

Each truck to be equipped with:

- 1. l one-quart chemical extinguisher
- 2. l axe
- 3. 1 shovel
- 4. Exhaust turned up perpendicular, or equipped with an adequate spark arrester or muffler.

VI. TRACTORS (Gas and Diesel)

Each tractor to be equipped with:

- 1. 1 one-quart chemical extinguisher
- 2. 1 axe
- 3. 1 shovel
- 4. Exhaust turned up perpendicular, or equipped with an adequate spark arrester.

VII. SMOKING

Copies of the law prohibiting the throwing away of lighted material and rules prohibiting smoking should be posted in conspicuous places.

VIII. WATCHMAN

Required for at least two hours after any spark-emitting or electric engine has stopped.

IX. CLEANUP

- Fall snags over 15 feet high within 150 feet of any sparkemitting electric or cat landing.
- 2. Clean up within 35 feet of any spark-emitting or electric engine.

(Use Washington State form S. F. No. 4667.)

Washington

- I. PERMITS (Chapter 193, Laws of 1945 as amended by Chapter 218, Laws of 1947)
- 1. Each owner or operator is required to obtain a written permit from the Supervisor of Forestry before cutting any timber.
- *-2. A permit is required for operation of power-driven equipment in dead and down timber (Chapter 18, Laws of 1953).-*
- II. TOOLS REQUIRED FOR WOODS OPERATION (or mill-within one-eighth mile of forest land)

Any woods operation, between April 15 and October 15 using sparkemitting or electric engines shall be provided with the following tools, or the serviceable equivalent thereof, at each landing, and/or yarding tree:

1. For operations employing five men or less:

A sealed fire-tool box containing at least:

- (a) 2 axes
- (b) 3 shovels
- (c) 3 adze hoes

To be kept adjacent to the tool box:

- (d) 1 bucking saw with handles
- (e) 100 gallons of water or a 5-gallon pump can of water
- (f) 2 buckets
- 2. For operations employing more than five men:

A sealed fire-tool box containing at least:

- (a) 3 axes
- (b) 6 shovels
- (c) 6 adze hoes

To be kept adjacent to the tool box:

- (d) 2 bucking saws with handles
- (e) I five-gallon pump can of water

III. SNAG AND CLEANUP REQUIREMENTS (Snags-Chapter 13, Laws of 1951)

l. West of the Cascade Mountains, all snags 25 feet in height and 16 inches DBH and over shall be felled currently with the felling of live timber or with the current logging operation. *-(Notice of violation must specify chapter of law violated.)-*

There are some exceptions for operators working in dead timber where the number of snags to be felled is based on the average number per county as determined by the Supervisor of Forestry.

2. On both East and West sides, fall snags over 15 feet high within 150 feet of any spark-emitting or electric engine or cat landing.

IV. WATCHMAN REQUIREMENTS

Required for at least two hours after any spark-emitting or electric engine has stopped.

V. YARDERS, SKIDDERS AND LOADERS (Gasoline, diesel or electric)

- 1. 2 chemical extinguishers, 1-1/2 quart each.
- 2. Exhaust turned up perpendicular.
- 3. Tools as listed in II above.

VI. TRACTOR REQUIREMENTS

- 1. One 1-quart chemical extinguisher.
- 2. Exhaust turned up perpendicular, or equipped with an adequate spark arrester.

Good Practice: One short-handle R.P. shovel.

VII. TRUCKS

- 1. 1 one-quart chemical extinguisher.
- 2. Exhaust turned up perpendicular, or equipped with an adequate spark arrester or muffler.
 - 3. 1 axe.
 - 4. 1 shovel.

VIII. POWER SAW

- 1. l eight-ounce chemical extinguisher or
- 2. l serviceable shovel.
- *-3. Device adequate to prevent emission of sparks or equipped with adequate muffler.**

Good Practice: If fallers carry an extinguisher only, a tool box containing hand tools (shovels or adze hoes, or both) to be moved daily to the general vicinity where the fallers and buckers are working.

*Amended 6-17-53 R-6 F. C. Hdbk.

No. 75

IX. STEAM LOGGING ENGINE OR BOILER

- Spark arrester (except where there is not a forced draft)
- 2. Power pump--20 gallons per minute at 40 pounds
- 3. 300 feet one-inch hose
- 4. l nozzle
- 5. Adequate device to prevent escape of fire or live coals from ash pans and fire boxes
 - 6. Tools as in II above

X. LOGGING LOCOMOTIVE

- 1. Spark arrester
- 300 feet one-inch hose
- 3. Sealed tool box with:
 - (a) 3 axes
 - (b) 6 shovels
 - (c) 6 adze hoes
 - (d) 2 bucking saws with handles
 - (e) l five-gallon pump can
- 4. Power pump-20 gallons per minute at 40 pounds
- 5. Sprinkler to wet 2 feet on either side of each rail
- 6. Adequate water supply for sprinkler
- 7. Adequate device to prevent escape of fire or live coals from all ash cans and fire boxes.

XI. SPEEDER PATROL

- 1. Speeder patrol to be equipped with:
 - (a) 2 shovels *-(one must be No. 2 round point)-*
 - (b) laxe
- (c) 1 five-gallon pump can *-filled with-* water *-(d) Exhaust pointed up perpendicular or equipped with adequate spark arrester-*
 - *-2. Any railroad speeder must be equipped with:
 - (a) 1 No. 2 shovel, round pointed
- (b) Exhaust pointed up perpendicular or an adequate spark arrester-*

Good Practice: Speeder equipped with radio if there is a tie-in with a radio net.

XII. LINES

Good practice requires clearing away all inflammable debris in front of the corner block and maintaining a hand pump filled with water near by. Siwashing of dry logs and snags or contact with solid rock should be avoided. During extremely hazardous fire weather, area of corner block and back line should be patrolled by a watchman.

> *Amended 6-17-53 R-6 F. C. Hdbk. No. 75

XIII. BLASTING

-The use of fuse for blasting on any area of logging slash or area of actual logging operation during the period June 15 to October 15 is prohibited.-

XIV. TANK TRUCKS

Good practice requires that all truck operations provide a tank truck (at least 300-gallon capacity) equipped with a fan belt or other power take-off type pump and necessary accessory equipment. A portable power pump on a truck operation serves a dual purpose. It can be used with a truck or trailer tank and also as an independent unit where water is available away from the road.

XV. WEATHER INSTRUMENTS

Good practice requires the furnishing of instruments to determine humidity and temperature on each operation. Large operations should have a hygrothermograph and small operations a hygrometer or sling psychrometer. Both hygrothermographs and hygrometers should be checked frequently for accuracy with a psychrometer.

XVI. SMOKING

- 1. Throwing away lighted material is prohibited in forest, *-brush or range-* areas *-during the closed season.-*
- 2. Smoking is prohibited by any individual when in motion through areas of logging slash and areas of current logging operations, except on paved or surfaced roads.
 - 3. Copies of the law to be conspicuously posted in the operation.

XVII. COMMUNICATION

Good practice requires that steam operators have telephone communication to the "outside" and, if the operation is large enough to justify the expense, between headquarters camp and the operating "sides".

XVIII. OTHER

Check for compliance with additional stipulations which have been made in special contracts (to be added to this list before operation is visited).

*-XIX. CLOSING FOREST OPERATIONS (Sec. 216-1) WESTERN WASHINGTON

Supervisor of Forestry's policies on logging closures:

1. District Warden has authority to define term of close-down when he issues close-down order for local area or entire district. He will determine if road work, sawmilling operations and other operations not involved in logging may be excepted. Burning permits in Zones 2 and 3 are automatically canceled in the closed area.

*Amended 6-17-53 R-6 F. C. Hdbk.

No. 75

- 2. Logs may be hauled through a closed area from other areas only on hard-surfaced roads or major county graveled roads.
- 3. When the District Warden orders a local close-down, he will inform adjoining districts and the Forest Service of the order and its details.
- 4. When a State shutdown is made, all operations connected with logging and all land-clearing operations are closed. This includes repair work, road work, and maintenance work in which the use of spark-emitting equipment is necessary. It includes all types of installations, whether they be logging, sawmill, or military. Unless specific mention is made, such a shutdown order will not apply to major highway construction, where cutting and filling is being conducted in mineral soil.
- 5. A State shutdown order from Olympia automatically cancels all burning permits in Zones 2 and 3.
- 6. Sawmills located in Zones 2 and 3 which are more than 1/8th mile from forest land and maintain open fires will have their activities curtailed or suspended. Mills having completely-adequate enclosed burners or those disposing of mill waste other than by burning will be allowed to operate. The District Warden will judge how practical it is to completely extinguish mill-waste fires in open pits, commensurate with adjacent hazards, and decide if the fire should be held down or extinguished. It will be the general policy that mills as described in this paragraph will not be allowed to operate where mill waste is added to open fires.
- 7. If the sawmill operation itself is hazardous and within 1/8th mile of forest land, operation during the close-down order will not be permitted. A hazardous mill may be defined as one situated in a very bad location from a fire standpoint, one which is poorly managed thereby being a potential fire hazard, or one which is dangerous because of its proximity to slash areas.
- 8. In the case of a desire to do road work specific exceptions may be made by the District Warden, with the approval of the District Supervisor, if such are made in advance of the fire season and all parties have a clear understanding of responsibilities. The District Warden also has authority to make other exceptions when they are desirable, but they must be unusual before such exceptions can be made.
- 9. When a statewide closure is in effect, and weather conditions change for the better in a district, to the extent that it is the District Warden's opinion that logging is safe, immediate notice must be given to Olympia. For that area the shutdown will then be lifted and returned to the District Warden's option.
- 10. When a statewide closure is in effect, the District Warden should not make any announcement as to the lifting of a closure until clearance is given from Olympia. This may be as above in section 9 or it may be a general rescinding of the order and a return to local option of the District Warden.-*

XVII. COMMUNICATION

Good practice requires that steam operators have telephone communication to the "outside" and, if the operation is large enough to justify the expense, between headquarters camp and the operating "sides".

XVIII. OTHER

Check for compliance with additional stipulations which have been made in special contracts (to be added to this list before operation is visited).

FIRE CONTROL HANDBOOK REGION 6



PART II PREPAREDNESS

CHAPTER I

ANNUAL FIRE SUPPRESSION

PLANS

FIRE CONTROL HANDBOOK REGION 6

PART II

PREPAREDNESS

CHAPTER 1

ANNUAL FIRE SUPPRESSION PLAN

ANNUAL FIRE SUPPRESSION PLAN

The forest or ranger district fire suppression plan is a tool for use to secure adequate and efficient action on all fires. To be of most value, it should be stripped of all superfluous meterial and indexed so that the information will be quickly accessible. The plan should be made up in two sections and each section subdivided to best meet the needs of individual forests.

Section 1

The first section should contain concise statements by the super-visor on local forest fire suppression policies, objectives, responsibilities and standards including a list of essential references such as Firefighters' Wage Rates and Rental of Fire Equipment, Part III, Chapter 4, Fire Control Handbook; Dispatcher's Work Book; regional policies and standards, NF-A4; and the many other available items and material the dispatcher, ranger and fire boss will need.

<u>Policies</u>: Include all information pertaining to forest and local fire suppression policies, such as:

Responsibility for dispatching and use of emergency crews.

Use of cooperators.

Use of lookout firemen and other guards on fire suppression.

Use of machinery.

Use of resources between ranger districts and forests.

Objectives: Objectives are necessary in order to have a goal for accomplishments in the preparation and prosecution of the plan. They should be based on the worst probable situation the local fire fighting organization may have to handle.

Responsibilities: In order that the organization will function smoothly, it is necessary to have a definite line of authority and that each forest officer know his responsibilities. These things should be covered definitely in the plan. If desired, lines of authority and the related responsibilities of the various positions in the fire-fighting organization may be shown in chart form.

Standards: Local suppression standards are usually required to attain the desired accomplishment or objectives. They should cover such items as:

Control and mop-up.

Travel time standards.

Standard rates of line construction for the various "resistance to control" classes for local application.

The percentage of crews or the number of men to be held in stand-by status over week-ends or other periods. This will usually be based on fire danger classes and then covered in detail in strength-of-force plans.

R-6 F.C. Hdbk.

Revised 3-7-44

The above information remains fairly constant for a forest, and since only those directly affected need copies, two or three years' supply may often be duplicated at one time to advantage. The required number of copies should be sent district rangers prior to the fire season for use in making up their Fire Suppression Plan.

Section 2

The second section should contain a list of available personnel, equipment, supplies, and transportation. This is the information required in day-to-day dispatching and, therefore, a complete revision should be made annually and changes noted currently throughout the fire season.

The more quickly men, transportation, equipment and supplies can be assembled, the fewer the number required. Available local labor can be assembled, and transported to a fire much more quickly and with much less expense then men from distant labor markets. It is, therefore, very important that a thorough canvass be made of the local overhead, labor, organized crews, and transportation facilities, and that the necessary information be recorded and kept current throughout the fire season. It is of equal importance to have a list of emergency guards and individual cooperators who can be quickly dispatched to fill the positions vacated by regular guards, be available for other assistance during an emergency, or take direct action on small fires.

This information can best be assembled by the district ranger or district guard in connection with other work prior to the fire season for the district zone of influence and by the fire staffmen for the outside territory not covered by the district ranger.

Six printed forms, Form 89 R6, Sheets 1 to 6, are available, on which can be listed most of the required dispatching information. Sufficient space should be left between entries to facilitate making current changes. The form headings and description of their use follow:

Form 89-R6 Sheet 1	FOREST	AND RANC	ER	DISTRICT	DISPATO	HING	PLAN		
Dileco T									
(National Forest))						(Cla	ssificat	ion)
			Reg	gular Per:	sonnel				
(Ranger District)								(Year)	
		Position	or		- :	Addı	ress,	Station	or
Name	:	Title		:Telepho	one No.:		Resi	dence	

Sheet 1 may be used for listing the forest supervisory staff; ranger district organization (including guards); federal, state and county officials (including Justice of the Peace); adjoining state and private fire associations; designated physicians, etc. A separate sheet may be used for various subclasses and the classification indicated in the upper right—hand corner. More than one line may be used for a single entry if necessary. Further explanatory material may be placed on the back if desired.

Form 89-R6 FOREST AND RANGER DISTRICT DISPATCHING PLAN Sheet 2 (Classification) (National Forest) Emergency Guards and Large Fire Overhead (Ranger District) (Year) : Qualifications or : Position to Occupy : Dispatching: Whom - Where - How Name Sheet 2 may be used for listing emergency guards; division, sector and camp bosses; foremen; ground and line scouts; airplane cargo droppers; cargoers; tractor, truck, pump and radio operators, etc. Under qualifications, list the same jobs as are checked on the Assignment Card (Form 9-R6) and on Fire Cooperator Card (Form 85-R6). In the dispatching column, include the information necessary for reaching the individual with a telephone call or messenger. Form 89-R6 FOREST AND RANGER DISTRICT DISPATCHING PLAN Sheet 3 (National Forest) (Classification) Organized Crews (Ranger District) (Year) : No. : Foreman : Equipment & : Dispatching: Unit or Location : Men : or Leader : Transportation: Whom - Where - How Sheet 3 may be used for listing all organized crews such as logging crews, highway crews, mining crews, sawmill crews and community crews that have been organized under specific leadership and trained in fire suppression and for which advance arrangements have been made. FOREST AND RANGER DISTRICT DISPATCHING PLAN Form 89-R6 Sheet 4 (National Forest (Classification) Unorganized Fire Fighters (Ranger District) (Year) : No. : Equipment or : Men : Transportation : Dispatching: Whom - Where - How Name or Source Sheet 4 may be used for listing unorganized fire fighters and directors of federal and state employment offices. Form 89-R6 FOREST AND RANGER DISTRICT DISPATCHING PLAN Sheet 5 (Classification) (National Forest) Equipment & Transportation (Ranger District) (Year) Dispatching: No. :Whom - Where - How : Units : Type - Size - Kind Owner

R-6 F. C. Hdbk. Revised 3-7-44 No. 18 Sheet 5 may be used for listing trucks, private cars, buses, pack and saddle stock with or without rigging, speeders, boats, trains, airplanes, and other forms of transportation; fire equipment caches and locations of unassembled stocks of equipment; and special equipment such as tractors, pumpers, tankers, horseplow units, Bosworth transhers, etc. List only equipment that is in serviceable condition.

Form 89-R6 Sheet 6	FOREST AND RANGER DISTRICT DISPA	TCHING PLAN
(National Forest)	Supplies	(Classification)
(Ranger District)		(Year)
	: Check Supplies Can Furnish	
	:Gro-: :Bak-:Lun-: Other -	: Dispetching:
Name of Firm	:cery:Meat:ery :ches: List	: Whom Where How

Sheet 6 may be used for listing the sources of available supplies and materials, such as groceries, meat, bakery goods, lunches, hardware and horsefeed; also for listing restaurants having facilities for feeding fire fighters.

The Plan

The District Ranger Fire Suppression Plan will consist of the super visor's policy statement (Section 1), references to other available material on fire suppression, and one copy of the dispatching information (Section 2) assembled for the district. The ranger may prepare such additional copies of his plan or parts as considered necessary or required locally, but the number should be based on actual needs.

The Forest Fire Suppression Plan will consist of the supervisor's policy statement (Section 1) and copies of the dispatching notes (Section 2) sent in by the rangers, together with the dispatching notes prepared for territory outside of the ranger's zone of influence. The Forest Plan should be assembled and indexed by either classifications or ranger districts.

FIRE CONTROL HANDBOOK REGION 6



PART II PREPAREDNESS

CHAPTER 3
FIRE SUPPRESSION PLANS FOR AREAS OF SPECIAL HAZARD

FIRE CONTROL HANDBOOK

Region 6

PART II

PREPAREDNESS

Chapter 3

Fire Control Plans For Areas of Special Hazard

FIRE CONTROL PLANS FOR AREAS OF SPECIAL HAZARD

Introduction

Areas of especially high hazard such as Douglas-fir burns, cut-over lands (especially those with unburned slash), blowdowns, lodgepole pine deadenings, and hazardous brush areas require special attention to insure adequate prevention, preparedness, and suppression action. In order to prevent mancaused fires and speed up action on fires in these areas of special hazard, it is essential that prevention and preparedness plans are adequate and that special suppression plans be prepared and maintained in convenient form for each area. Fire control plans for cut-over areas will usually be preceded by and will be correlated with hazard reduction plans.

Prevention Plans

Ranger district prevention plans may be adequate for the hazardous areas involved. This is likely to be true where the hazard has existed for a considerable length of time and was present when the ranger district prevention plan was made. Examples are the old Douglas-fir burns. On the other hand, the district prevention plan may have to be intensified and supplemented for newly created or acquired hazardous areas such as out-over lands with unburned slash, or a fresh burn where cheat grass or other highly inflammable fuels are rapidly becoming established. Prevention measures to be considered should include closures, signs and poster plans, patrol and other prevention measures. Detailed instructions for prevention work may be found in the Fire Control Handbook, Part I, Chapter 1.

Preparedness Plans

Guard Placement and Strength of Force Plans should include provisions for areas of special hazard in accordance with the hazard and risk involved. Where experience has shown that present measures are inadequate, or for new hazardous areas, preparedness plans should be revised or supplemented. Detection should be planned to give very intensive coverage within an 8-mile radius. Travel coverage should be studied and steps taken, either by placing additional guards or improving travel facilities, to provide fast initial action during periods of high fire danger. In cut-over areas study should be made to determine what roads should be maintained for travel after logging is completed. Communication facilities should also be provided as required. It may be practicable to use radio in place of telephone where the extra protection will be necessary for only a few years.

Suppression Plans

The suppression part of a fire control plan for a hazardous area is intended to serve two major purposes: first as an aid to a fireman in his travel to a fire, and second for information of fire suppression overhead in the event of a fire requiring crew action. Both of these needs can quite adequately be met by the use of a well-prepared map on a large scale with any

necessary explanatory material attached. The plan should be made in graphic form as far as possible, and all features and developments that will be of actual help to the fireman or suppression forces should be shown on the map. Additional necessary information which cannot be shown on the map should be assembled on the explanatory sheets kept with it.

Field Personnel

The field work should be directed by an experienced fire control man in order that the factors pertinent to the control of a fire will be taken into account and the map not cluttered with nonessential details. Assistants should be selected for their accuracy and competency.

Signing and Marking Hazardous Areas

It is vitally important that hazardous areas be correctly and plainly signed and marked. The Sign Handbook contains specifications for the special fire break, pump chance, etc., signs. Other special signs such as for airplane dropping locations, supplemental lookout points, desirable routes of cross-country travel, prominent ridges or sections of open country suitable for a control line, possible camp sites, temporary and spur roads, drinking water, rock slides, strips of piled and burned slash, etc., should be posted. Temporary signs may be used but should be replaced with permanent signs as soon as possible.

Fire Plan Maps

Maps should be prepared on a scale of 2" or 4" to the mile in order to provide space to show all the necessary data in sufficient detail. Photographic enlargements of one-half inch base maps are usually not satisfactory because of exaggerated size of lines and lettering.

Map Features. All outstanding features found on the ground should be shown on the map. (See samples Figures 1 and 2). The standard symbols should be used insofar as practicable and other symbols added to show any other features desirable.

Topographic Maps

Where suitable topographic maps covering the area are available, they should be included in the plan folder with the fire plan map.

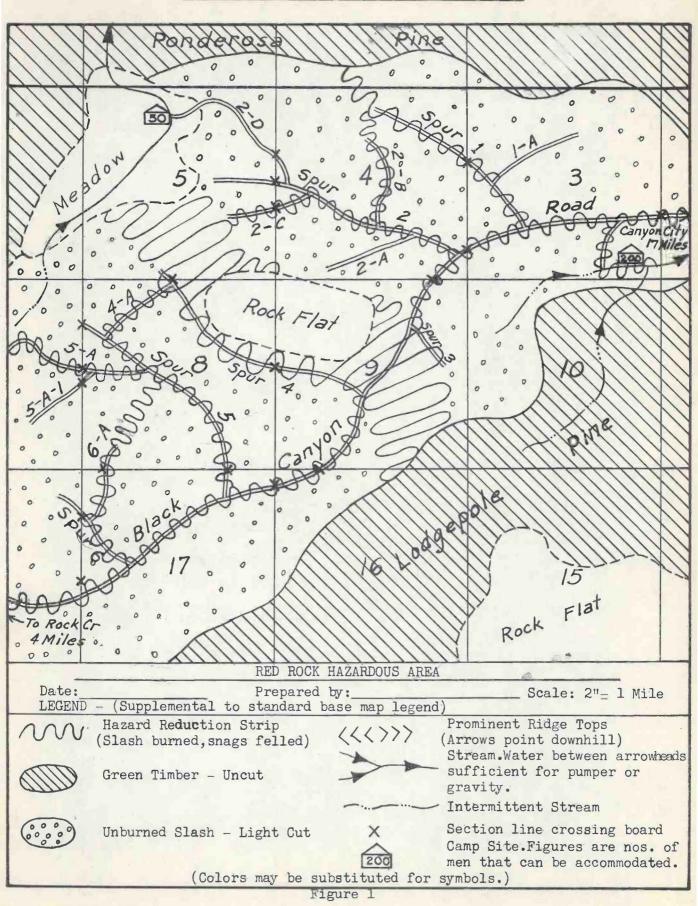
Forest Base Map

A $\frac{1}{4}$ " forest or district base map should be included with the plan for orientation.

Fuel Type Maps

½" scale, colored up-to-date fuel type maps should also be included with the assembled plan. Where possible, a more intensive fuel type map should be

SAMPLE FIRE CONTROL PLAN MAP FOR HAZARDOUS AREA EAST SIDE OR SELECTIVELY LOGGED DOUGLAS-FIR



SAMPLE FIRE CONTROL PLAN MAP FOR HAZARDOUS AREA WEST SIDE

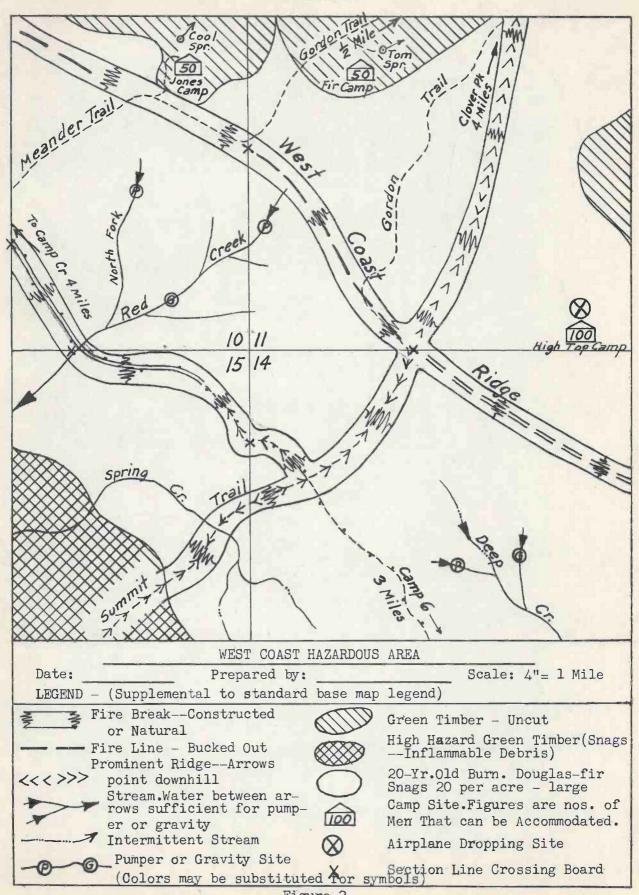


Figure 2

made on a 2" or 4" scale showing smaller areas of fuel types and the type distinction more accurately.

Aerial Photographs

If the hazardous area has been photographed from the air these prints should be included with the plan.

Panoramic Photographs

Where the hazardous area is visible from a lookout and close enough to it for the detail of the topography and cover to show up in the panoramic picture, extra prints of the quadrant showing the hazardous area should be included in the plan.

Explanatory Sheets

Where it is desirable to elaborate on the information shown on the fire plan map, explanatory sheets should be prepared and kept with the plan. These sheets should be as brief as possible and have the information arranged conveniently. It may be desirable to include such information as:

- (1) Peculiarities of topography Steepness of ridges and slopes, presence of rock
 bluffs, rims, saddles, chimneys, etc.
- (2) Danger factors Height, diameter, and condition of snags and number
 per acre, presence of mossy and bug-killed timber,
 heavy windfall areas, slash, etc.
- Weather peculiarities Wind and local draft characteristics such as up
 canyon during day and down canyon at night, or during
 northeast wind period blows northeast during morning
 and early afternoon ordinarily switching to northwest
 in late afternoon and evening. Other weather peculiarities such as: early morning fogs but extremely low
 humidities in afternoon, or troublesome cross-canyon
 winds with low humidities during night usually latter
 part of August.
- (4) Other factors Danger of spotting with adverse wind, soil, and control line construction data, possibilities of horse or power line construction, etc.

Plan Assembly

Some convenient method should be used for assembling the plan for each hazardous area so it can be found quickly. The following is suggested:

- 1. Keep approximately 25 fire plan maps in a manila folder marked to show contents.
- 2. Keep 6 copies of the topographic map (if available) and 2 copies of the $\frac{1}{4}$ " base map (forest or district) in a manila folder marked to show contents.
- 3. Keep three fuel type maps, two copies of aerial, and two copies of panoramic photographs (if available) in a manila folder marked to show contents.
- 4. Keep three sets of explanatory sheets for each area or compartment in a manila folder marked to show contents.
- 5. Enclose the four separate manila folders in a red file folder. Another manila folder can be fastened over the top of the file folder and staples used to hold the flap in place (this prevents the loss of contents around a fire camp and keeps out dust and dirt). This file folder should be plainly marked with the name of the hazardous area. (A speedball pen-size B-4 makes good sized lettering for marking both the manila and red file folders.)
- 6. One copy of the hazardous area fire plan map should be filed in the district ranger's office, one in the supervisor's office, and one in the regional office. It is suggested that these copies be kept in the Fire Control Management Plans atlases. They are especially valuable for recording information sent back from the fire line on the spread of the fire and status of control work. The R. O. copy can also be used in ordering additional copies from Surveys and Maps if the fire is of such extent to justify. Also a copy of the fire plan map should be furnished each fireman that may go to fires in the area.

Field Distribution of Plans

The suppression plan for a hazardous area should be kept at the district ranger's headquarters. When a fire occurs for which the plan is needed, the folder should be sent immediately to the fire boss at the fire. Copies of the fire plan map should be given division bosses, scouts, sector bosses, and foremen. The other plan material should be distributed in accordance with the local situation. The SOS or camp boss will ordinarily have use for a copy of the 2" scale base map.

Importance of Fire Control Plans for Hazardous Areas

For the past several years a great proportion of the large disastrous fires in this region have occurred in areas for which special fire control plans have been made. On such occasions, the plan maps have been very useful but their accuracy and the adequacy of details could be improved. A recheck of existing plans as well as careful preparation of new plans for recently acquired or developed hazardous areas is very desirable.

FIRE CONTROL HANDBOOK REGION 6



PART II PREPAREDNESS

CHAPTER 4
MISCELLANEOUS PLANS

FIRE CONTROL HANDBOOK REGION 6

PART II

PREPAREDNESS

CHAPTER 4

MISCELLANEOUS PLANS

PART II - PREPAREDNESS - CHAPTER 4

MISCELLANEOUS PLANS

Table of Contents

			Page No.
Section	1	-	Method of Seen-Area Mapping
Section	2	_	Methods for Plotting Travel Coverage
Section	3		Planning the Fire Control Organization and Fire Equipment and Other Preparedness Needs

MISCELLANEOUS PLANS

Section 1 - Methods of Seen-Area Mapping

Efficiency in planning a detection system depends largely on the accuracy of the seen-area maps. Three methods of making these maps are included in the following pages. They are:

- 1. Field sketching.
- 2. Profiling. (From topographic maps).
- 3. Photographic. (By use of panoramic photos).

The definition of "seen-area" used in mapping in R-6 is: All area within a radius of 15 miles where the ground or the vegetation growing thereon can be seen directly from the observation point.

Field Sketching

The advantages of this method lie in its simplicity, accuracy, economy and the opportunity of obtaining other information pertinent to the development of the point. Aside from the travel time involved in getting to the observation point, the time spent in the sketching method is less than that required for the other methods. If the base maps available are inaccurate, field sketching is a far safer method, as the mapper has an opportunity to check the map's accuracy.

Preparation

The following equipment is usually necessary for sketching seen areas in the field:

- 1. Axe, belt.
- 2. Binoculars (6-8 power).
- 3. Climbers, with safety belt and rope.
- 4. Compass.
- 5. Erasers.
- 6. Level, Abney, per cent, for determining tower locations.
- 7. Map board (about 16" x 16", preferably plywood).
- 8. Maps 1/2" of country to be mapped, topographic if available.

1/4" of forest for reference purposes.

- 9. Nails, for fastening map board.
- 10. Notebook.
- 11. Pencils, colored and drawing.
- 12. Pins, one dozen ordinary straight.
- 13. Pocket knife.
- 14. Scale, engineer's, triangular (ft. and tenths).
- 15. Sun glasses.
- 16. Tape, 50', for tower determination.
- 17. Timber crayon.
- 18. Thumb tacks or Scotch tape.

Set-up

The mapping board should be mounted on a solid, level support. If the point is heavily timbered, a tree top may have to be cut off to provide a base for the mapping board. It is desirable to complete the map from one vantage point, but on timbered points, round or flat hill tops, it may be necessary to move around and occupy several points during the mapping process. Trees or other points from which the sketches are made should be marked for future references.

Orientation

The map must be level and oriented with the topography by locating several corresponding landmarks on both map and ground and lining them up to fall on the line of sight established by the scale pivoted on the map location of the lookout point. At least three prominent landmarks should be used to orient the map. The oriented map should check consistently throughout its 360° of arc. Additional vantage points, if any appreciable distance from the original set—up, should be cut in accurately with the scale and located on the map.

Mapping Procedure

It is essential that the mapper take every possible advantage of good visibility. It is not possible to see as much detail in topography when looking into the sun as when looking away from the sun. The mapper should begin at a point to the right of the sun's position in the sky and map clockwise so he will usually be mapping topography into which the sun is shining.

All seen areas within the 15-mile limit are to be shown in a solid color and unseen spots left uncolored. An effort should be made to include

the exact area that will be seen from the lookout house or tower after the point has been developed and visibility clearing has been done. Where supplemental points within fifteen-minute round trips from the main point are mapped, their seen area should be shown in another color and described in the legend.

The seen areas closest to the lookout within any sector are sketched in first, using the triangular scale to shoot in the right and left horizontal limits of visible ridges and other features. With topographical maps the ridge tops can be outlined by tracing in the contour crest at the correct ridge between the right and left limits. The lower limits of visibility are sketched in by accurate comparison of the ground and map locations of drainages, cultural features such as roads, ranches, power lines, or other known features.

Not more than a 10 or 15 degree arc should ordinarily be mapped at one time. Where there are long, continuous ridges that occupy a major portion of the mapping sectors, it may be better to map by ridges than by arcs.

After the map has been completed, circles showing 5, 8, and 15-mile distance should be added. The mapper's name, date, and name of point should be placed on the back of the map.

Determining Tower Location and Height

When the mapper is on the point it is sometimes desirable for him to obtain information as to the approximate location and height of the tower if one is required.

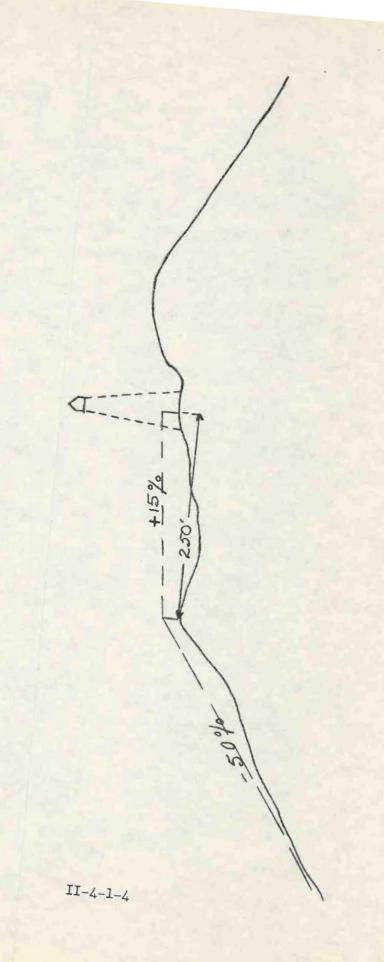
Where the irregularities of the point are such that important areas beneath the point cannot be seen, the mapper first chooses what appears to be the most logical location for the tower, setting up at this point a pole to which a marker is attached at eye height. He then goes down the slope toward the important blind area until it becomes visible. From this point two abney readings are made, the first to the lower limit of the desired visible area and the second to the eye height marker on the pole. Next the mapper measures the horizontal distance to the pole, preferably with tape. With these data the following calculations can be made: Subtract the grade in per cent toward the pole from the grade in per cent to the lower limit of visible area. (If the grade in per cent toward the pole is minus, the two per cents should be added). Multiply this result by the horizontal distance to the proposed lookout station and divide by 100. Several different locations should be tried to insure that the location has been found that will require the lowest tower.

Example: The grade toward the pole is -15%. The grade to the visible area limit is -50%. The distance to the proposed tower is 250.

 $50 - 15 \times \frac{250}{100} = 87$ height of proposed tower

(Note: Instructions for the (2) Profiling and (3) Photographic methods will be added later).

R-6 F. C. Hdbk.



R-6 F. C. Hdbk.

Profiling Method

If a topographic map is available for the area to be mapped, the approximate seen area from a lookout point can be determined in the office by the profiling method. This method may be used in the winter or other times when field conditions are unsatisfactory. Physical discomforts such as wind, cold, and mapping from a tree are not a factor and the mapper has better access to drafting instruments and facilities. With the profiling method the mapper is not required to identify unfamiliar topography and the definite nature of this method does not provide much variation of individual judgment.

Where the point is covered with a dense stand of timber it is possible with the profiling method to determine the approximate area that can be seen after clearing shall have taken place, or the seen area to be obtained by various tower heights.

The accuracy of the seen area map depends upon the accuracy of the topographic map, and errors in the topographic map, especially at close range, may result in considerable inaccuracy in the seen area map.

It is often desirable to use a combination of both the field sketching and profiling methods if desible. A trip to the point provides information on local conditions and a sketch map for the close range areas may be made quite accurately. Then in the office the profiling method can be used to complete the more distant portions of the seen area map with more accuracy than can be obtained by field sketching.

Preparation. Materials needed for profiling are a contour map of the country extending at least 15 miles from the point, drafting board, drawing and colored pencils, scotch tape, straightedge, and cross section paper divided into inches and tenths.

<u>Procedure</u>. Draw a light radius line from the location of the point at the center of the map in any convenient direction. The beginner may be aided by drawing the first line across known territory or roughly at right angles to nearby ridges or hogsbacks.

At the top left-hand corner of the graph paper, beginning at an elevation about 1000 feet higher than that of the point, lable the horizontal lines so that each tenth inch line equals two hundred feet.

Fold the top evenly back and under along the horizontal line corresponding to the elevation of the point. Place this fold along the radius line drawn on the map, with the top left-hand corner of the graph directly over the point. Fasten in place with scotch tape.

Where the radius line intersects contour lines, drop imaginary perpendiculars to the corresponding elevations on the graph paper, placing dots at these points.

Connect these dots, and the outline of a vertical section of the topography results.

A light line drawn from the point, tangent to the top of the adjacent ridge will intersect a farther ridge at the lower limit of seen area. Referring to the corresponding contours on the map it can be readily determined what area along the radius line can be seen and should be colored in.

Radius profiles from 5-70 apart should be similarly worked out for the entire circle. A skillful mapper will soon discover many short cuts and will learn to omit many parts of the profile which are obviously blind. He may be able to take larger sectors near the point and interpolate short profiles at the outer edges of the map as the other profiles diverge.

Additional coverage such as that gained by a tower may be computed merely by adding the height of the tower to that of the point and profiling as before.

Photographic Method

Where panoramic photographs are available, seen area maps may be prepared with considerable accuracy. If topographic maps are also available, they should be used as the base for the seen area map. The advantages of this method as contrasted with field sketching include a more accurate orientation, generally a clearer view of the distance due to the pictures having been taken on clear days with haze cutting film and filters, absence of physical discomforts, and accessibility of the mapper to better drafting facilities.

Preparation. The following equipment is required for this method.

1. A good set of panoramic photographs, covering 360°.

2. A large celluloid protractor, with an 8-inch-radius semicircular opening cutout, graduated into 120°, with a straightedge arm pivoted on a push pin at the center. The arm is graduated in half inches to indicate distance from the point.

3. The best half inch map of the surrounding area available-

topographic if available.

4. Miscellaneous drafting materials, such as drafting and colored

pencils, drafting board, tape, etc.

5. A rectangular piece of plastacele an inch larger than the photographs marked with a level line 2/3 the distance from the bottom. Alternating black and green inked lines perpendicular to the level line and running across the plastacele mark at ten and five degree intervals respectively. Another strip of plastacele is prepared, numbering the ten-degree intervals from 0° to 120° to cover the degree numbers of the photograph and make them correspond with the numbering of the degrees on the protractor.

Orientation. The azimuth correction, if any, should be calculated for the photograph, and over a light table the correct azimuth should be set off by attaching the photograph on top of the plastacele, level lines coinciding, and fastening it and the degree numbering strip in place with scotch tape.

The light showing through the photograph gives the illusion of sunlight and brings out details, and the five degree intervals showing through allow interpolation of the azimuth of any point to a degree or less.

The map is placed under the protractor, with the lookout point directly under the pinhole in the center and held in place by the push pin pivot which is put through into the drawing board beneath. The map is then oriented with reference to the photographs.

The lateral extent of ridges or the horizontal boundaries of any object seen on the photographs may thus be determined on the map.

If the map has contours, the upper limits of seen area can be outlined by tracing in the contour crest of the correct ridge between the right and left limits as in sketch mapping, and a mechanical profiler or "harp", is of great assistance in determining the lower limits of a line of sight projected over the top of an adjacent ridge and intersecting a farther one. The "harp" operates on the same principle as the profiling method. Adjacent areas can be readily sketched in from reference to the photo.

Where only base or drainage maps are available, the mapper must estimate both upper and lower vertical limits. The lateral extents may be read from the photographs and plotted.

It will aid a great deal in all types of seen area mapping, and especially in the photographic method, if the mapper will consider that he is coloring in areas which would be illuminated if a strong light were shining from the lookout at night and he were overhead in an airplane. A similar effect is given with a car's headlights on a rough or wavy road 150-200 feet ahead of the car. From inside the car very little of the road ahead appears to be dark, just as very little of the topography appears blind to a lookout. Considerably ahead of the car, however, the light and dark patterns from a vertical perspective, which is the map perspective, show much more area blind.

The October, 1938 issue of Fire Control notes contains an illustrated article on visibility mapping from panoramic photographs which may be considerable help in understanding the details of this method.

The following figures should be studied to obtain a clear understanding of the size and shapes of blind areas from various perspectives and on different topography:

Observation Point Lower Than Intervening Point Observation Point Level With Intervening Point Observation Point Higher Than Intervening Point

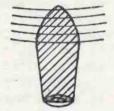
Background - Level Plain



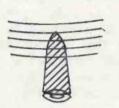




Background - Hillside







R-6 F. C. Hdbk. Page added 9-11-41 No. 3

MISCELLANEOUS PLANS

Section 2 - Methods for Plotting Travel Coverage

In preparing travel coverage maps, the procedure should be as follows:

- 1. Select a $\frac{1}{2}$ " scale forest base map showing up-to-date road and trail information (location and travel speed) for each potential fire guard or suppression crew location under consideration.
- 2. Draw a circle around the potential guard or crew location. If the main travel is to be by trail or cross country, a 4 to 6-inch radius should be adequate. If the main travel is to be by road the circle should be large enough to include the 1 hour travel zone in "H" and "X" rate of spread fuel and the 2 hour travel zone in "L" and "M" rate of spread fuels but in no case should the radius of the circle be larger than 9 inches. The travel time by zones should be computed for the area being studied within the circle.
- 3. Each zone will include all the area it is possible to reach within an allotted time from the selected position. Consideration should be given to actual travel time on roads, trails, and across country by means of the fastest routes and best available methods of transportation.

The zones should be bounded by solid color lines as follows:

a.	0 - 30 minutes	red
b.	30 min 1 hour	orange
C.	1 hour - 2 hours	yellow
d.	2 hours - 4 hours	green

- 4. Dividers may be used to step off distances on roads, trails and across country by setting them at the estimated rate of travel per hour. For instance, if the rate of travel on a trail was 2 miles per hour the dividers would be set one inch apart for use on a $\frac{1}{2}$ " scale map. A correction will be necessary to compensate for grade and curvature in routes of travel.
- 5. In areas with many roads, time can be saved by computing and showing the travel zones on the roads only. After the best positions have been selected, the boundary of the various travel zones can be roughly shown in colored lines if by so doing planning will be facilitated.
- 6. Each map should contain a legend and be trimmed to a size suitable for filing (usually in a large envelope in the Fire Control Management Plans binder.)
- 7. Travel coverage overlays are prepared by (a) placing a piece of vellum paper over the map described above, (b) tracing the boundaries of the nearest township with a broken line for orientation purposes, and (c) tracing the boundaries of the travel coverage zones. Travel coverage zones can be identified either by written notation of time standard or by colors, or both, depending on needs. (Preparation of individual vellum overlays in advance of actual planning needs is not advocated.

MISCELLANEOUS PLANS

Section 3 - Planning the Fire Control Organization and Fire Equipment and Other Preparedness Needs

Fire control planning should be based on study of past fire records, existing conditions and future trends.

Analysis of Past Fire Record

Factual data should be secured on fire occurrence, the past accomplishment of the existing fire organization and fire danger and weather records.

Fire Occurrence

A study of fire occurrence will determine the zones of greatest fire risk, cause, period when fires occur, and peak loads. This information will be helpful later to determine changes, if any, in the location of the regular fire organization, employment period, and strength of force.

The zones of fire risk and distribution of lightning and man-caused fires can be determined by studying the forest fire occurrence maps for at least the past decade. Additional information on man-caused fires can be secured by studying the charts, maps, and tabulations in the District Ranger's Fire Prevention Plan. Information on number of fires by periods can be secured from the individual fire reports (Form 929), and it should be summarized statistically for at least the past 10 years. Headings for such a tabulation follow:

***************************************	Cart Tolo	Number of Fire	es by 10-Day Period to 19	<u>1</u>
	HE P PER	Ranger District		_ National Forest
Year:1- Year:1- 1945 1946 1947-* etc. Total 10-yr.	10:11-20:21	:April, etc., for ds: each mo30:1-10:11-20:21-30	: 10-day Periods :	Date of Peak Loads and Number of Fires

Past Accomplishments of the Existing Fire Organization

A study should be made to determine the extent each regular protective position, designated cooperator, other forest officer, forest work crew, or the general public contributed to detection and initial suppression action on fires. Detection should be broken down into first and second discovery and fire suppression into action by one or two firemen and by small crews. Basic

information for this study should be taken from the individual fire reports covering the past 10-year period. Information on second discovery ***
ill have to be obtained from the Dispatcher's Action Record (Form 2-R6).
Headings, with samples, for summarizing the above information follow:

9 0 1 1 7

		mplishment ing Organ						
	19	0 0		,				
Ran	nger Di	strict				Nat	ion	al Forest
								1
	:_ I	Detection		Initial	Supp.	Action	1:	
Position -	:			1-2	:	Crew	:	
Crews - Cooperator - etc.	:lst s	shot:2ndsh	ot:	Firemer	n:Over	2 men	: R	lemarks
Silver Peak, LF	3	3 2		2	,	casto		
Myrtle R.S., F	qu	D 080		12		2		
Buckner Slash Crew	2	L		2		8		
etc. (** - Coops, etc.)								

The tabulation will show the regular positions that have proved most valuable for detection, the extent to which individual firemen were used to suppress fires, and the location from which crew action was taken; also the extent of detection and suppression action taken by cooperators, regular forest officers, work crews and the general public. This information will prove valuable later when selecting and locating the regular fire control organization. It would be desirable to include in the tabulation the year fires were discovered and the discovery distance for each fire by showing this information under "Remarks" or in separate columns under "Detection".

Fire Danger and Weather Records

Occasionally the comparative value of two or more stations will not be apparent from the accomplishment record and additional information will be desirable, particularly on fire danger and weather. An example would be summer fogs that reduce the effectiveness of an otherwise excellent lookout. Also the differences in fire danger zones on a ranger district is sometimes great enough to influence the placement of a fireman or crew. Analysis should be made of these records as required.

Analysis of Existing Conditions and Future Trends

Conditions constantly change in large forest areas or in protection methods. Man-caused risk varies with large construction projects, development of forest camps, shifting of hunting seasons and number, location and type of industrial operations. Fuel types change when timber is cut and when snags fall in old burns and reproduction comes in. The construction of roads and the use of aircraft will effect transportation.

In analyzing future conditions principal consideration should be given to (1) areas recently cutover and timbered areas subject to cutting within the next 5-year period, and (2) dedicated roadless areas and areas which, because of a lack of commercial timber products or other resources, do not need roads for utilization or administration.

R-6 F.C. Hdbk. HHHDeleted 8-16-54 No. 89

- (5) Lookout-fireman stations should not be selected until suppression coverage has been analyzed since their final selection should be based on both suppression and detection coverage plus any other contributions. On many ranger districts lookout-fireman stations cannot be justified. The exclusive seen area for those selected should be added to the composite seen-area overlay, usually in a different color.
- (6) The composite seen-area overlay should be placed on a fuel-type map or an up-to-date hazard map which includes any large areas to be cut within the next 5 years. It can be secured lightly with transparent tape. (If the fuel-type map does not show rate-of-spread types in solid colors, this step can often be facilitated by making a vellum overlay of rate-of-spread fuel types each rate-of-spread type shown in a different color.) Usually this step and the planning steps which follow will not be completed until other members of the organization have been selected.
- (7) After the primary lookouts and lookout-firemen have been selected, tests should be made to locate a temporary lookout point or a series of points that will provide direct visibility to high risk operating areas with "H" and *-"E"-* rate-of-spread fuels, not otherwise supplied from any reliable source (lookouts, cooperators, watchmen, forest users ***). In selecting temporary lookout points sketches of their seen area coverage should be placed on the combination of overlay and map described in the foregoing step. Usually plans should provide for furnishing direct visibility to these critical areas within a 5-mile radius during periods of high fire danger or poor visibility. Temporary points to be used to furnish intensive protection for short periods will be shown on strength-of-force plans. ***
- (8) Vantage points should be planned to furnish direct visibility of 5 to 8 miles to areas not otherwise covered. They will be selected by placing seen-area overlays from prospective points on the combination overlay and map described in step (6) plus the occurrence map. Vantage points will be depended on for cross shots on lightning fires in a good share of the rough mountainous area when aerial detection is not available. In many cases the final and best plan cannot be made until prospective points are mapped. The selected vantage points will be taken care of in strength-of-force plans.
- (9) After temporary lookouts and vantage points have been selected, another composite seen-area overlay should be made which will show seen-area coverage from the primary lookouts, fireman-lookouts, temporary lookouts, and vantage points. As changes are made, the map should be revised.
- (10) Holes should be made on plotting boards for all approved primary lookouts and lookout-fireman stations and usually for selected temporary lookouts and vantage points. ***
- *-(11) Forests with large roadless areas should plan a skeleton primary detection network supplemented by aerial detection. Generally, airplane detection will be planned following lightning storms and to investigate reported doubtful smokes.-*

The Suppression Organization

Objectives: For the ranger district or other unit under consideration, the objectives of planning the suppression organization should be:

(1) to initially reach a fire in "L" or "M" resistance-to-control fuel types and the following rate of spread types with one or more firegoers (guard, cooperator, other forest officer, smokejumper, member of a crew) within the following time limits:

Rate-of-Spread Type	٠.	Travel Time Standard
-E- H .		½ hour 1 hour
. M		2 hours
L .		4 hours

Based on past records, these time standards cannot be justified in many instances for areas of low occurrence and particularly in the "L" and "M" rate-of-spread fuels or "L" resistance-to-control fuels, nor can the standard be met until the transportation system is completed. ***Solid blocks of 10,000 acres or less will seldom justify additional manpower for these fuel types. The availability and use of special equipment should also be considered.

- (2) To initially reach a fire in snag areas of "H" or *-"E"-* rate-of-spread fuels with two or more firegoers in less than l-hour travel time. Small crews centrally located at transportation hubs are indicated for these fuel types where the fire occurrence clearly justifies such action. Small mobile and highly competent crews with longer travel time are preferred to widely scattered single firegoers with less travel time.
- (3) To initially reach a fire in slash areas of "HH", *-"HE", "EH", and "EE" -* fuel types with a crew of 3 to 5 or more firegoers in one-half to one hour with suitable special equipment, such as pumpers, tankers and/or tractors. The crew to be centrally located near the hub of existing or proposed transportation routes.
- (4) To provide a competent fireman to operate each planned tanker and tractor-plow outfit when available.
- (5) To correlate and justify the location and use of all firegoers, including crews, with fire occurrence and fire danger.
- (6) Each position or crew should be studied on the basis of past records and future changes in conditions by analyzing:
 - (a) Has valuable suppression service (and detection service in the case of lookout-fireman) been provided either within or outside the unit?
 - (b) Are changes in fuels or risk likely to increase or decrease the value of the position?

- (c) Does it provide the best coverage to areas of high values, bad fuels or special risk?
- (d) Can positions be consolidated or can they be correlated with other jobs and still maintain justifiable suppression values?
- (e) Has or will the transportation system, including the use of aircraft, affect travel coverage?

Planning Steps: The major steps for planning suppression coverage are:

- (1) Up-to-date travel coverage maps, on vellum overlay, should be available or made for all existing and potential firegoers such as fireman, lookout-fireman, and prevention guard and for such Forest Service crews as will be based at a known location.
- (2) To determine the need for regular seasonlong fireman and look-out-fireman, the travel coverage overlays for prospective stations should be spotted on a fuel-type map or an up-to-date hazard map (or on a fuel-type vellum overlay See step (6) under "Planning the Detection Organization"). The selection of the best locations, to meet the foregoing objectives, must be correlated with (a) the location of prevention guards, (b) suppression crews, (c) work and project crews, (d) other forest officers, (e) availability of smokejumpers, (f) detection coverage gained, (g) availability of dependable cooperators, (h) existing improvements, (i) existing and planned roads and trails and transportation facilities, (j) availability and location of industrial crews, (k) availability of special equipment, and (l) temporary intensive protection measures to be taken on operating areas and areas with a special slash hazard. The various planning steps should be carried on at the same time so as to obtain the best over-all organization to meet the objectives.
- (3) In determining the travel coverage to be obtained from available smoke jumpers, estimate 3/4 hour for getaway from the landing field, 100 miles per hour for travel in the air, $\frac{1}{4}$ hour for jumping to the spot selected in the vicinity of the fire, and travel time from the jumping spot to the fire.
- (4) To determine the need for suppression crews to meet the objectives (i.e., crew of 3 or more men financed from protection funds), an analysis should be made of the availability of other manpower during the fire season. This can best be done by analyzing the average annual finances available for the next 5 years on the ranger district and preparing a manpower plan or schedule as follows:

(a) Estimated average annual income or finances available:
Item Coop. slash disposal, snagfalling and intensive protection. Timber-Stand Improvement (KV funds) *-C.R.I* Road and trail maintenance Other improvement maintenance Administrative guard funds Timber Sale Officers (not on permanent salary account). Special work projects if they can be foreseen (Construction, Blister Rust, etc.) Reserves on hand for use in next 5 years Other (if any) Total average annual income Amount needed for equipment, materials, supplies,
transportation, etc
(b) Manpower plan on basis of above balance:
Period Summer or fire season
Number men available in above for fire season
(5) After the above manpower plan has been analyzed as to number and tion, the needs for suppression crews should be determined by studying el coverage in relation to snag areas and existing or prospective cutareas with "H" and *-"E"-* fuels. Some adjustment will be needed between location of project or work crews and suppression crews. In some cases can best be combined. On many ranger districts suppression crews will

- locat trave over the : not be needed because of the availability of other manpower.
- (6) After the location of all firemen, lookout-firemen, and suppression crews has been decided and approved, a composite travel-coverage overlay should be prepared. This will aid in deciding the location of other manpower during the fire season. The travel coverage of others, such as prevention guards, should be added after they have been planned.
- *-(7) The normal period of employment for the regular protection force (Block A, Form 22-R6) will be based on the past record of fire occurrence and experienced judgment. Employment of the emergency force (Block B, Form 22-R6) and pre and post manning of the regular protection force will be based on fire danger and fire risk .-*
- (8) Fire prevention guards will be planned for on the basis of needs as determined by an analysis of private industrial operations and slash disposal, issuance of burning permits, closures, public contacts, suppression coverage. and volume of forest use when there is danger from fire. The planned period of employment will depend on fire occurrence, fire danger, weather, and work load.

R-6 F.C. Hdbk. *Amended 8-16-54 No. 89

- (9) The administrative fire organization at the ranger district headquarters will be planned on the basis of needs from a protection standpoint but correlated as necessary with the needs for other activities. The planned period of employment from protection funds will depend on fire occurrence, fire danger, and the protection work load.
- *-(10) The selected and approved firemen and lookout firemen positions and suppression crews will be listed on Form 22-R6. Those that can be financed from regular funds will be listed in Block A. All others will be listed under emergency positions, Block B, and financed from FFF in accordance with F.S. Manual instructions (GA-F, Title 3, Chapter 5).
- (11) Project or work crews and guards primarily furnishing intensive protection to slash areas and financed from other than protection funds will be listed on the strength-of-force plans and should not be listed on Form 22-R6.-*

Organization Map

After the fire guard organization has been selected, approved, and listed on Form 22-R6, an organization map should be prepared on a ½-inch scale base map of the ranger district. It should be made to fit opposite Form 22-R6 in the Fire Control Management Plan binder. It should show the protective and ranger district boundaries and all guards and crews listed on Form 22-R6. ****

Planning Communication for Fire Control

Certain aspects of general communication planning can be tied specifically to fire control planning. Communication facilities also need to be available for fire suppression use. Specific standards for use in planning fire control needs are as follows:

General

Regular lookouts, firemen, patrolmen, Forest Service crews, logging crews, and other cooperating crews and agencies should have dependable communication (Forest Service, private or commercial) for both station and field use. Such communication should be correlated with other communication needs.

Telephone

(1) Telephone communication should be provided to dispatching headquarters, to all regular lookout and other guard stations, and to all established crew camps or headquarters. Exceptions will be made where reliable and economical radio communication can replace long telephone lines with few telephone instruments.

- (2) Temporary field telephone instruments should be installed to tie all field crew and temporary lookouts and firemen where this can be done arectly or where only a short spur line is needed.
- *-(3) Temporary field telephone instruments should be installed to imber sale operations wherever practical and the advantage to the Government justifies.-*

Radio

- (1) For use by regular guards and Forest Service crews not provided with a telephone.
- (2) For standby on most centrally located primary lookouts so firegoers and operators of mobile fire equipment can report in at any time.
- (3) Light-weight radios to be available for use by most firegoers, such as regular and temporary guards and competent selected cooperators, if they are apt to go to fires a considerable distance in travel time from available communication.
 - (4) For use by smokejumpers.
- (5) For use in the field, during working hours and when there is danger from fires, by suppression or work-project crews if telephone communication is not available.
- (6) For use by those occupying temporary lookout or vantage points not equipped with a telephone.
- *-(7) For standby suppression use (reference should be made to fire-equipment planning).
- All radios for uses described under 2 to 7, inclusive, are shown on the Communication Plan in the forest Fire Control Management Plan binder.
- (8) For use on Timber Sale operations where telephone is not practical. Where operator uses radio, priority should be given to a tie with the Forest Service system by use of two receivers, one placed in one of our stations on the operator's frequency and one on the Forest Service frequency for use in conjunction with their transmitter at the logging site. If the operator has no going radio system, consideration should be given to limited use of Forest Service radio. The policy governing their use may be found in the F. S. Manual, Volume 3, Title 13, 202.5.-*
- (9) Radios for normal fire-suppression needs in the ranger district, particularly for initial action on small fires, will be available from those planned for use by individual firegoers and suppression crews and those installed in mobile equipment.

Radios for use by scouts and in large fire camps and extra radios needed for concentrations of lightning fires, will be stocked at interforest caches, available on requisition.

R-6 F.C. Hdbk. *Amended 8-16-54 No. 89

Planning Transportation Needs

The needs for additional trails and roads for protection should be based on the objectives for planning the suppression organization (See "The Suppression Organization" in this section), and after considering timber-disposal plans for location of future-utilization roads and the possible use of airplanes. The needs for roads, including short connecting links, in slash areas should be planned on the basis of instructions in the F. C. Hdbk., I-2.

The All-Purpose Transportation Plan Map should be revised as necessary to show utilization roads and spurs required for intensive protection of slash areas. These should be shown as permanent or temporary based on planned needs. Temporary roads should be eliminated from the plan when the slash ceases to be a special hazard or is rated as "M" rate of spread. Usable temporary roads should be shown on Fireman Maps.

Planning the seasonlong use and assignment of aircraft will be on an interforest or regional basis and handled as a special project.

Planning Protection Improvements

After all field guard stations have been selected and approved, the improvements needed will be listed on Form 674-R6.

Planning Fire Equipment

Forest and ranger district plans should provide for an adequate supply of fire-suppression equipment for the following purpose:

- (1) To equip regular guards, extra and temporary guards, year-long officers, suppression and other forest crews, and community cooperative organizations.
- (2) To provide a minimum number of complete caches at rangers' headquarters and other strategic points to equip small crews as needed.
- (3) To provide an adequate supply of unassembled tools and special equipment at ranger and forest headquarters to equip available crews in the interval required to transport equipment from interforest or other stocks.

In estimating the amounts of the various kinds of equipment needed in the ranger districts and the forest, and determining locations, consideration should be given to fuel types, fire danger, fire occurrence, sources of available labor, location of interforest caches, transportation facilities, and time required for transportation from equipment sources. Plans should be coordinated between adjoining ranger districts and forests.

Assembled Caches

One, two and eight-man caches, and stampede units should be planned to equip the district ranger and other forest officers, regular fire and administrative guards, extra or temporary guards, cooperative smokechasers, Forest Service suppression and work-project crews, and small cooperative crews. Ordinarily assembled caches larger than eight-man will not be required. Stampede units should be planned for highly trained and competent Forest Service crews in areas where back packing is necessary.

One and two-man caches should be considered for small crews in camps, as well as at ranger and guard stations, if lightning fires may require a number of supplemental smokechasers. Four-man caches may be better than one eight-man cache for a crew of eight men; however, an eight-man cache can be divided into smaller outfits if rations and packboards or knapsacks are added. If the crew is provided with stampede outfits, a packboard for each man will, of course, be available.

Minimum standard lists for one, two and eight-man caches, and a suggested list for stampede outfits are given in the *-F.C. Equipment Hdbk., Section I.-* Ordinarily, the standard minimum lists as given, or with substitutions indicated in the notes following the lists, should be adhered to; but where fuel types require, items not shown or increased numbers of listed items may be included. However, in working out the forest standards, extra tools should not be included beyond the need for the crew to be equipped and for the particular conditions involved.

The minimum standard lists do not apply to caches planned for use by cooperators. These should contain only such tools as the cooperators will need pending arrival of a forest officer at the fire.

Unassembled Tools

The quantity and location of unassembled tools to be stocked in the ranger district should be based on (1) the probability of fires occurring that cannot be handled by individuals or crews for which assembled caches are provided, and (2) an estimate of sources and numbers of men for probable fire needs that can be obtained quickly during the summer months, equipped with overhead and started to the fire in the interval necessary to obtain equipment from the forest or other ranger-district stocks, or from the nearest interforest cache.

A reasonable supply of unassembled tools should be provided at the supervisor's headquarters, or other central point on the forest, as initial equipment for the number of men likely to be needed in addition to those available in the ranger districts, and who can be recruited in the vicinity of the supervisor's headquarters or other central point, assembled with overhead, and transported to the fire before equipment can be obtained from the nearest interforest cache.

In planning for unassembled stocks both in ranger districts and at the supervisor's headquarters, transportation time, facilities, and routes are very important. Any tendency to stock too many tools locally should be guarded against.

Proportionate amounts of camp equipment must be provided at points where unassembled tools are stored. Telephones should be planned for on the basis of at least one instrument for every 100 men that can be equipped with firefighting tools.

It is of prime importance that control-line equipment be suitable for the work that must be done. To provide for this without misunderstanding and loss of time, tool lists for forest use should be compiled for crews of various sizes in excess of eight men and for different fuel types as necessary. Tools can then be quickly dispatched according to these lists, or with variations as requested by the fire boss to meet the particular conditions encountered. The number of such lists should be held to the minimum consistent with actual needs. Copies should be posted near the tool racks and included in the annual fire-suppression plan.

Special Equipment

In planning for special equipment, such as trucks, tractors, and power pumpers, consideration should be given to the availability of such equipment at interforest caches, the practicability of using other Forest Service equipment, and the possibility of hiring privately-owned equipment. Ordinarily heavy equipment should be planned on a forest rather than on a ranger-district basis.

*-Trucks and Pickups: The following fire control needs for trucks and pickups should be planned for and included in the forest motor equipment base except that dependable rented equipment may be substituted when the advantage to the Government justifies:

- (1) Truck transportation (1½-ton or larger) will be required during the fire season for interforest caches, regional fire cache, regional remount stock, interforest suppression crews and tractor-plow units. Management devices, such as hauling at night, in the early morning, and on days of subnormal burning-index classes, and the use of radio for contacts with drivers, should be considered in planning current use of trucks during the fire season, so as to obtain maximum all-purpose use.
- (2) Pickups (3/4 and 1-ton) should be planned for 100 to 250-gallon slip-on tankers. The policy generally requires that slip-on tankers will be carried in pickups or trucks during the fire season and not stored in warehouses or on platforms except for intermittent short periods when the vehicle is engaged in hauling. These pickups should be provided with a radio and maximum use made of these vehicles to provide transportation for seasonal and yearlong forest officers.-*

*-Fire Tractor-plow Outfits and Other Forest Service and Private Dozers and Equipment Trailers: Plan on maximum use of machinery for fire controlline construction utilizing the above-mentioned source of equipment. In recent years the use of private logging tractors and dozers for fire line construction has far exceeded use of Forest Service fire tractor-plow outfits and it is not planned to replace those on hand when they are no longer reliable. Advance arrangements should be made for equipment trailers to haul heavy tractors and dozers.

Tankers, Slip-on with Demountable Pump and Engine: Only slip-on tankers will be purchased and use should be planned as follows:

- (1) 100 to 250-gallon slip-on tanker should be planned to fill all except special needs.
- (2) 250 to 400-gallon slip-on tankers should be planned where there is definite need for more water on initial attack than can be provided by the smaller units referred to above. These units will be transported on 12-ton or larger trucks.-*

Portable pumpers should be included in forest and ranger district plans. Ordinarily a minimum of one pumper, with accessories as listed in the F.C. Equipment Hdbk., Section K, should be provided for each ranger district.

Forms

Planned fire-suppression equipment, and the inventory of special equipment, should be summarized for each ranger district and the forest on Form 22-R6, Block C. Copies of these forms will be maintained in the regional office.

Form 19-R6 is to provide for the district ranger's use in recording the location of caches and the individual items of unassembled equipment planned and on hand, by locations. Copies of this record will not be kept in the regional office. *-Fire equipment in the interforest and regional caches will be listed on Form 19-R6 and copies filed in the regional atlas. Copies of interforest cache Forms 19-R6 should be furnished the supervisors concerned and one copy for posting at the interforest cache.-*

Reference Material for Fire Control Planning

- (1) Base Map showing ranger district and process.

 - (2) Fire Occurrence Map for at least past decade (NF-A, Title 6, R-6 1101.81) and Fire Control Management Plan binder.-

(3) Analysis of man-caused fires (I-1, F. C. Hdbk.)
(4) Burning Index and Weather Records - Form 82-R6, Form 84-R6, and Form 1009-E.

(5) Individual Fire Reports - Form 929.

Dispatcher's Action Record - Form 2-R6.

Fuel Type Maps (II-2, F. C. Hdbk.) and Fire Control Management Plan binder.,

- *-(8) Man-Created Hazards Form 90-R6; I-1, F.C. Hdbk.; and T.M. Hdbk., R-6 Part IV.-*
 - (9) Detection-coverage maps, discs or overlays. On forest.

(10) Travel-coverage maps or overlays. On forest.

(11) Transportation Plan maps and tabulations. (12) Communication Plan maps and tabulations.

(13) Forest Management Plans.

- *-(14) Annual Fire Suppression Plans, NF-A, Title 6, R-6 502 and II-1, F.C. Hdbk.-*
 - (15) Strength-of-Force Plans Form 88-R6 and II-5, F. C. Hdbk.
- *-(16) Fire Control Plans for Areas of Special Hazard NF-A, Title 6, R-6 502 and II-3, F. C. Hdbk.
 - (17) Fire Control Organization Planning NF-A, Title 6, R-6 502 and II-4, F.C. Hdbk.
 - (18) Fire Equipment Planning NF-A, Title 6, R-6 502 and II-4, F.C. Hdbk.
 - (19) Regional Interpretation of FF Policy Manual, GA-F, Title 3, 503 and FC-D3-2a.
 - (20) Slash Disposal Appraisal and Methods NF-A, Title 6, R-6 403 and I-2, F. C. Hdbk.-*
 - (21) Fire Control Organization and Equipment Plan Form 22-R6.
 - (22) Ranger District Fire Equipment Plan and Inventory Form 19-R6.
- *-(23) Protection Improvement Planning NF-A, Title 6, R-6 1006, GA-C3-3, and Form 674-R6.-*

FIRE CONTROL HANDBOOK REGION 6



PART II
PREPAREDNESS

CHAPTER 5
FIRE DANGER RATING

FIRE CONTROL HANDBOOK REGION 6

PART II

PREPAREDNESS

CHAPTER 5

FIRE DANGER RATING

FIRE DANGER RATING

Table of Contents

	Tage No.	
Introduction	II-5-1	
Fire Danger Measurement	II-5-1	
Burning Index Factors	II-5-1	
Fuel Moisture.	II-5-1	
Wind Velocity.	II-5-1	
Integrating Burning Index Factors	II-5-2	
	II-5-2	
Burning Index Values	II-5-2	
Burning Index Classes		
Burning Index Value Tables Nos. 1 and 2	II-5-3	
Burning Index Class Table.	II-5-4	
Action Factors	II-5-4	
Visibility	II-5-4	
Risk	II-5-5	
Advance Estimates of Fire Danger	II-5-6	
Estimating Procedures	II-5-6	
Fuel Moisture	II-5-6	
Relative Humidity.	II-5-6	
Wind Speed	II-5-7	
Fire Weather Forecasts	II-5-7	
Revision of Estimates	II-5-7	
Estimate Schedule	II-5-7	
Variation of Fire Weather Elements	II-5-7a	
Fuel Moisture	II-5-7a	
Relative Humidity	II-5-7b	
Risk		
	Speed II-5-7b bility II-5-7c ion II-5-8 Localities II-5-8 Moisture Zones II-5-8 bility Zones II-5-8a	
Risk Zones	II-5-8a	
Strength of Force Plans	II-5-8a	
Legend	II-5-8b	
Chalistical Information	II-5-8b	
Statistical Information	II-5-8b	
Mechanics of Plan.		
Sample Strength of Force Plans	II-5-9	
Manning Positions	II-5-10	
Action on Specific Activities	II-5-11	
Preparation of Fuel Moisture Zone Maps	II-5-11	
Step 1. Analysis of Past Fire Danger Records	II-5-11	
Records to be Used	II-5-11	
Tabulating the Records	II-5-11	
Computing Values	II-5-11	
Computing Averages	II-5-13	
Determining the Zone for Each Fire Danger Station	II-5-13	
Step 2. Delineation of the Fuel Moisture Zones	II-5-13	
How the Limits of Each Zone are Determined	II-5-13	
Sample Fuel Moisture Zone Map Analysis Form	II-5-14	
Non-Forest Land.	II-5-15	
Map Scale and Size	II-5-15	
	II-5-15	
Finishing the Map	エエーンーエン	

R-6 F.C. Hdbk. Entire Page Amended 6-24-52

Table of Contents (Cont.)

			Page No.
Fire Danger Stations			TT_5_15
location			
Equipment			
Placement of Instruments	•		II-5-16
Fuel Moisture Indicator Sticks			II-5-16
Fuel Stick Scales			
Wind Gauge and Wind Vane			
Psychrometer			
Operation			II-5-17
Fuel Moisture Sticks			II-5-17
Fuel Stick Scales			II-5-18
Wind Velocity			II-5-18
Visibility			II-5-19
Measurements with Visibility Meter			II-5-19
Measurements by Ocular Estimation			
Relative Humidity			
Supplies, Repair, Replacement and Storage of Equipment			II-5-20a
Fire Danger Instruments			
Records and Reports	• •		II-5-20a
Fire Danger Rating Assembly Record (Form 82-R6, Rev. 6-51).			II-5-20a
Order of Listing Stations			
Advance Estimates of Today's Danger			
This Morning's Estimate of Today's Danger			
Today's Measured Danger			
Burning Index Value			
Highest Station B.I			
Average Zone B.I			
Zone B.I. Class			
Rain			II-5-20c
Lightning Over District		• •	II-5-20c
U.S. Weather Bureau's Fire-Weather Forecast (back of			
form).	• •	• •	II-5-20c
Breaks in Station Records	* ,*	• • •	11-5-200
At Close of Season			11-5-20¢
Burning Index Record	• •	• • •	TT_5_200
Fire Danger Station Description - Form R6-F6	• •		TT#27
Sample Fire Danger Rating Assembly Record	• •	• •	11-2-21
Chatiana Companion with the II S. Woother Russey			TT-5-22
Stations Cooperating with the U.S. Weather Bureau	• •	• •	II-5-22
Records at Fire-Weather Stations			II-5-22
Instruments			II-5-22
Temperature and Rain-Measuring Stations			II-5-22
			_

FIRE DANGER RATING

Introduction

Fire danger rating is used in this region to determine, by a simple method, the effect of weather factors and fire starting agencies on the start, spread and discovery of fires for a given fuel and topographic condition. It provides a common unit of measure that has the same meaning to all persons concerned. Specifically, fire danger rating aids in determining the current action necessary for the proper management of prevention, preparedness, and suppression work. Fire danger records are also used as one of the bases for planning fire protection improvements, placement of guards, and other fire control facilities.

It is realized that other factors in addition to those considered in this chapter have some influence on fire danger. However, due to their relative unimportance and the difficulty of measuring and integrating or correlating them, they have not been included in the present system of fire danger rating.

Fire Danger Measurement

Fire danger is divided into <u>Burning Index</u> factors, which measure the potential capacity of fuels to ignite and a fire to spread, and <u>Action</u> factors, which qualify the action to be taken for a given Burning Index.

Burning Index Factors

Only two factors, fuel moisture and wind velocity, are used to determine the burning index.

Fuel Moisture: The start and spread of fires are largely dependent upon the condition of the finely divided fuels, such as litter, twigs, branches, dead needles, leaves, herbs, and grasses which serve as kindling at the start of a fire and as a connecting agent after the fire is spreading. Fuels with moisture in excess of 25%, as measured by indicator sticks, are barely ignitable, and fuels with moisture content below 25% become more inflammable as this moisture content decreases. Ignition of fuels of a given moisture content also varies somewhat with their kind, quantity, arrangement, and exposure to wind. To obtain the most accurate effect of fuel moisture content on fire, it would be necessary to measure all sizes and types of fuels from the finest moss to the largest windfall. Since this is impractical, it has been found most satisfactory to measure only the one-half inch fuel moisture indicator sticks. It is felt that such measurement is most indicative of the majority of important fire fuels.

Wind Velocity: Aside from the moisture content of fuels, wind is considered the most important factor affecting the start and spread of fire. Wind is extremely unstable, being subject to the occurrence of sudden gusts, dead calms, or brisk breezes within a short time. Topography and cover

affect the free movement of air and produce markedly different wind velocities and directions at various points on a management unit. This instability of wind makes it necessary that measurements obtained at a few stations on a unit be qualified in their local application. This variation is much greater than with fuel moisture, since the conditions which create changes in that factor take place more slowly and are decidedly more regular by comparison.

Integrating Burning Index Factors

Burning Index Values: Fuel moisture and wind velocity are integrated into burning index values of 1 to 100. These values indicate the true numerical effect of weather factors on the start and spread of fire. If fuel and topography (constant factors that also affect fire behavior) are assumed to be at a constant level, the difference in fire behavior between values 3 and 4 should be the same as between values 50 and 51. One hundred may not necessarily be the maximum value possible over a long period of years, but because of its practical application it will suffice for existing conditions. These values are not percent.

The condition of herbaceous plants and the moisture content of needles, leaves, and branches of growing trees and shrubs have an important bearing on the start and spread of fire. An adjustment due to the variation of these conditions is made by using two burning index integration tables. Table No. 1 is for green and Table No. 2 is for curing and dead herbaceous stage. Instructions as to which table to use are included under "Records and Reports".

Burning Index Classes: Obviously, specific administrative action cannot be taken for the numerous values indicated on the value tables; therefore, these values have been grouped into 10 burning index classes. Except for the lowest classes, there are a number of values which are assigned to the same class. The higher values within a class indicate worse conditions than the lower values, and this should be given consideration when taking specific action.

BURNING INDEX VALUE TABLE NO. 1

Use this table in the spring and until July 15, provided herbs and grasses have not already reached the curing or dead stage.

Wind					Fuel I	Moistu	re St	ick -	Perc	ent			
Velocity	3	4	5	6	7	8	9	10	11	12	13-15	16-25	Oyer *
0-3	15	11	8	5	2	la	la	la	lb	lb	lb	lb	0
4-6	21	17	13	9	6	3	2	la	la	la	lb	lb	0
7–9	30	25	19	15	10	6	3	2	2	2	la	lb	0
10-12	40	34	28	22	16	11	6	3	2	2	2	la	0
13-15	53	45	38	32	25	19	14	8	4	3	2	2	0
16–18	66	57	49	42	34	27	20	13	7	3	3	2	0
19-27	90	77	67	57	45	38	28	20	12	4	4	3	0

BURNING INDEX VALUE TABLE NO. 2

Use this table in early summer after herbs and grasses reach the curing or dead stage, and in all cases after July 15 to end of season.

Wind		W J S	No.		Fuel	Mois	ture S	tick	- Per	cent	direct		
Velocit	у 3	4	5	6	7	8	9	10	11	12	13–15	16-25	Over 25 *
0–3	19	15	11	8	5	2	la	la	la	lb	lb	lb	0
4-6	26	21	17	13	9	6	3	2	la	la	la	1b	0
7–9	35	30	25	19	15	10	6	3	2	2	la	1b	0
10-12	48	40	34	28	22	16	11	6	3	2	2	la	0
13-15	61	53	45	38	32	25	19	14	8	4	2	2	0
16–18	75	66	57	49	42	34	27	20	13	7	3	2	0
19-27	100	90	77	67	57	45	38	28	20	12	4	3.	0

^{**}

R-6 F.C. Hdbk. *Added 4/9/42

^{**}Deleted 4/9/42

BURNING INDEX CLASS TABLE

Class	B.I. Values
1 *	lb-la
2	2–3
3	4-8
4	9-15
5	16-24
6	25-35
7	36-48
8	49-63
9	64-80
10	81-100

^{*} For special cases may be divided into 1b and la.

Action Factors

Only two action factors, visibility and risk, are used to supplement burning index in applying fire danger.

Visibility: Visibility distance is the number of miles a lookout should be able to see the smoke from a small fire (approximately 10' x 20') under prevailing atmospheric conditions. Two kinds of visibility are recognized in this region. Dry visibility is that reduced by smoke, dust, or haze. Wet visibility is that reduced by any form of atmospheric moisture, such as rain, fog, mist, and snow.

Dry visibility for each station should be taken at face value. Wet visibility should be assigned class 1, except when a local summer fog shuts off the visibility of lookouts in whose exclusive seen area the danger of fire may be quite high, the visibility may be assigned its actual class.

Three visibility classes are recognized, as follows:

Class 1 (VI) Regular. 8 mile or better visibility.

Class 2 (V2) Emergency. Less than 8 mile visibility, but regular and emergency lookouts can see most of their exclusive seen area in which there is a risk likely to cause fires.

*Class 3(V3) Poor. Visibility is so reduced that regular and temporary lookouts are unable to see most of the area covered exclusively by their station. The areas which they cannot see are subject to a risk which is likely to cause fires.

Risk: Risk is the activity of fire starting agencies. It is divided into 4 classes, the first two man-caused, and the last two lightning.

- Class 1 (R1) All foreseen man-caused risks. Includes all activities which normally occur during the fire season and such peak use as 4th of July, Memorial Day, Labor Day, hunting season, and week-end concentrations of people at campgrounds, which can be foreseen.
- Class 2 (R2) All unforeseen man-caused risks. Justified only when unusual events occur, such as an airplane hunt, a large project fire, a gold rush, or similar out-of-the ordinary situations which greatly increase travel by less responsible persons.
- Class 3 (R3) Lightning: This class should be used if eny of the following conditions occur:
- a. When lightning storms are forecast by the Weather Bureau for the area in which the ranger district is located, provided that local cloud formations or information from adjoining protective units indicate that action on the forecast is warranted.
- b. When local weather conditions make it appear extremely probable that a lightning storm will occur, although no lightning storm forecast has been received from the Weather Bureau.
- c. When cloud-to-ground lightning has occurred but the storm was of short duration and not sufficiently serious to justify class 4 risk.
- d. When, following a severe lightning storm and the removal of class 4 risk, sleeper fires are believed to exist, this class may be used for a reasonable period. Ordinarily a few days to a week should be the longest period that this class is indicated following any one severe storm.
- Class 4 (R4) Extreme risk, lightning only. Upon the occurrence of a lightning storm of severe intensity, excluding lightning storms with only cloud-to-cloud strikes, this class should be promptly used for the area covered by the storm. Very rarely will this risk class be used for more than 72 hours following any one severe lightning storm.

Local definitions of risk are unnecessary since the standard regional classes include all phases of this factor.

R-6 F.C. Hdbk. *Revised 5-29-46 No. 35

Advance Estimates of Fire Danger

Advance estimates are the most important part of fire danger rating. Most strength of force action will be either planned or actually taken on the basis of estimated fire danger. The estimate of each day's fire danger should therefore be made or approved by the best available man on the district who will usually be the district assistant or district ranger. Since estimates are made for individual fire danger stations, the fireweather characteristics of each station must be well known to the estimator. These characteristics of each station must be well known to the estimator. These characteristics can be determined by analyzing past records. The estimator must decide to what extent the estimated conditions will differ from existing or from normal conditions. To do this he must know what the normal wind and fuel moisture conditions are for each station. He must decide to what extent predicted and observed weather conditions should influence his estimates. He should make these decisions by considering the known station fire weather characteristics, the Weather Bureau fire weather forecast, current weather indications, and advice of local experienced persons.

Methods for determining local station characteristics and using them as guides for advance estimates of station fuel moisture and wind speed are described in a booklet by the Pacific Northwest Forest and Range Experiment Station entitled, "Methods of Estimating Future Burning Index from Fire-Weather Forecasts and Local Weather Observations," revised May, 1950. Of the aids mentioned in that publication, the FM-AM is recommended for all stations. The W-3 is recommended for stations with 4:30 p.m. winds averaging greater than 7 miles per hour. Field tests have shown the following estimating procedures to be as reliable as any within practical limits.

Estimating Procedures

Fuel Moisture: For the evening estimate of the next day's 4:30 p.m. fuel moisture, assume no change from the current day's 4:30 p.m. value.

Morning fuel moisture estimates can be slightly more accurate than this through use of the FM-AM estimation aid mentioned above. This aid converts the morning observed fuel moisture into the expected 4:30 p.m. value.

With a high confidence forecast of rain, adjust the fuel moisture estimate in accordance with the rules of thumb in the above mentioned Experiment Station booklet.

Relative Humidity: For the evening estimate assume no change from the current day's 4:30 p.m. reading. For the morning estimate, assume no change from the 4:30 p.m. observation of the previous day.

R-6 F.C. Hdbk. Entire Page Amended 6-24-52 No. 70 Wind Speed: For the evening estimate use the average 4:30 p.m. wind speed computed individually for each station from previous records which may have been already tallied in the preparation of wind aids.

For the morning estimate, this average 4:30 p.m. wind is still the best for stations with such averages less than 8 miles per hour. The W-3 aid gives a higher accuracy for the windier stations.

Fire-Weather Forecasts: In general, the accuracy of forecast wind speeds and relative humidities at present does not surpass the accuracy of the recommended procedures, even after local correction factors have been applied. The accuracy of the forecasts may, however, be greater at some stations in some years.

Evening fire-weather forecasts of relative humidity and wind speed have been found to be as accurate as those issued the following morning.

Spot forecasts for individual stations are generally more accurate than figures adjusted to a locality from a general area forecast. Spot forecasts are usually as accurate as the estimate methods and may be used directly in making estimates for the particular station.

Despite limitations, the fire-weather forecast is still the only source of advance information on a weather change not already evident. The above recommended estimates that assume tomorrow's weather will be like today's, will be wrong whenever there is a change, and similarly, those based on the average value will be wrong whenever conditions substantially different from average occur. If a pronounced weather change is forecast, the organization should be prepared to change accordingly as soon as it is apparent that the weather change will actually occur. Those responsible for fire danger rating and action should always be familiar with the latest forecast.

If an important unpredicted weather change becomes apparent, plan immediately for any necessary organization changes. Local indications of such changes are important. All lookouts and those responsible for danger rating or action should watch for them and report them promptly.

Revision of Estimates: Advance estimates of the day's fire danger should be revised whenever it becomes apparent that conditions will be other than originally estimated. Such revisions should be based on strong evidence. Slight adjustments of evening estimates have been found to be wrong as often as they are correct.

Estimate Schedule: Estimates should be made as soon as the necessary information is available. A preliminary evening estimate may be made as soon as the 4:30 p.m. observation is available. The final evening estimate of tomorrow's fire danger should not be made until the forecast has been checked for indications of definite change. The morning estimate can be made as soon as the 8 a.m. observation is available. Morning estimates can be based on earlier observations if the proper corrections are known and applied. The method for recording estimates on Form 82-R6 is described under "Records and Reports" in this chapter.

R-6 F.C. Hdbk. Entire Page Amended 6-24-52 No. 70

Variation of Fire-Weather Elements

The following principles of variation in the fire-weather elements will prove useful for localizing a general area forecast to a particular location within the area. They will also be helpful when estimating a few hours ahead, without the benefit of aids, for an unmanned station, or for some time other than 4:30 p.m. They may serve as a guide when estimating for other than normal fire-weather and will give a better understanding of the variations often observed in the various fire-weather elements.

Fuel Moisture: Fuel moisture a day or less in the future will depend on the present fuel moisture and changes that occur. Tomorrow's lowest fuel moisture is likely to be the same as today's if the future wetting and drying factors are the same as the past factors. Some of the weather incidents that will cause tomorrow's fuel moistures to differ from today's are:

- (1) If rain occurred within the past few days, tomorrow's fuel moisture will probably be less than today's because moisture in the center of a deeply soaked stick is gradually withdrawn on successive dry days.
- (2) If no rain occurred last night or today but is expected before tomorrow's reading, the reading will probably be higher.
- (3) If fuel stick recovery of moisture during the night is more than last night owing to more dew or higher relative humidity, the moisture tomorrow afternoon will probably not drop as low as during this afternoon. Likewise, if the night recovery is less, the afternoon moisture will be less.
- (4) If more sunshine occurs tomorrow, the fuel reading will probably be lower, and, if less occurs, the reading will probably be higher.
- (5) If the lowest relative humidity tomorrow is higher than today, the fuel moisture will probably be about 1 percent higher for each 10 percent greater relative humidity. Conversely, a relative humidity 10 percent lower will cause about 1 percent lower fuel moisture.

The above weather influences may occur in different combinations. One may completely offset or obscure the effect of another. On the other hand, two may have the same effect and together will produce a greater change in fuel moisture.

Relative Humidity: Relative humidity is one of several weather factors that influence forest fire fuel dryness. While it is not used to determine the B.I. value and class or to describe conditions requiring specific action, it is valuable along with the fuel sticks in fire protection. The fuel sticks are not weighed with sufficient accuracy to show the precise time that the moisture content changes from a downward to an upward trend in the afternoon. This change in fuel moisture trend usually occurs at the time the relative humidity begins to rise. Owing to the density and thickness of fuel sticks, they do not dry out or gain moisture as rapidly as dead bracken, leaves, and grass. These fuels closely follow the rate of change in relative humidity. This is particularly important for areas where these fuels predominate. Relative humidity trends, therefore, provide the administrator with valuable information on changes to be expected in the trend of all fuel moistures and in planning attacks and taking action on large fires.

Relative humidity is usually lower at higher temperatures—the hotter the day, the lower the humidity. Minimum humidity therefore usually occurs at the time of maximum temperature. Exceptions may be expected when a wind shift during the day brings in air of different moisture content. As temperature normally decreases with increasing elevation, humidity correspondingly increases. Exceptions may occur with certain wind directions; for example, during east winds at stations west of the Cascades, lowest minima may occur at peak stations during the morning. On calm nights and before morning heating, humidities will be considerably higher in the cooler air settled in the valleys than in the warmer air above at the medium elevations.

Wind also affects humidity, particularly its night-time trend. When the wind dies after sunset, cooling takes place more rapidly than when the wind continues. Humidity at night will therefore rise less at windy stations or on windy nights.

Owing to the many factors involved, it is recommended that an advance estimate of minimum relative humidity for a station be based on the preceding day's observed minimum humidity. If the estimate must be made without knowledge of the preceding minimum humidity, base it on the forecast minimum adjusted to allow for the usual difference between forecast and observed minimum humidities at that particular station.

Wind Speed: Wind speed and direction measured at a given fire danger station depend on:

- (1) General air movement in the lower 2,000 feet of the atmosphere,
- (2) Topographic features such as ridges and canyons,
- (3) Friction between the atmosphere and the earth's cover,
- (4) Local drafts caused by heating or cooling,
- (5) The peculiarities of exposure of the wind instrument.

Air flows through valleys, around jutting points, up steep gullies, and over ridges or peaks in about the same manner as water may be observed flowing in a stream full of obstructions. Speed decreases on the wind-ward side of an obstruction, increases just beyond its edge, and decreases in the flow "shadow" behind it. The speed in forest openings within about 500 feet of the timber edge or under the forest canopy will be less than above the tree tops.

It should, therefore, be obvious that the observed wind is not likely to be the same at any two fire danger stations at any one time. The fire-weather forecast describes the air flow in a layer immediately above the earth's cover. It does not take into full consideration purely local effects of topography, cover, drafts, or instrument exposure. However, there are some stations which may be considered exposed directly to this general air flow, at least from certain directions. For many stations, the other factors more or less control the observed wind.

When wind speed above the main ridges is light, the direction in mountain gullies and valleys is usually up the valley in the daytime after the sun has begun to heat the air and down the valley at night.

Visibility

Changes in visibility from day to day will depend on cloud elevation, for occurrence, comparative temperatures at high and low elevations, wind velocity, and wind direction with reference to smoke sources. The Weather Bureau forecasts of cloud elevation and fog occurrence can be used with knowledge of local weather to estimate these effects on visibility. Whenever the temperature at upper elevations, as compared to lower elevations is higher than normal, smoke and haze do not rise sufficiently to clear the lower atmosphere. The effect will be most important near mills and communities but can also be noticed in remote areas. Smoke and haze will normally rise during the day and thus reduce the visibility at higher levels in the afternoon. During periods of light winds from the direction of industrial or forest fire areas, smoke is liable to drift in. When large fires are burning, strong winds may carry their smoke long distances, and, if the wind suddenly dies, the smoke may settle in these distant areas.

Risk

Risk can be estimated in advance from knowledge of the local human activities and lightning storm indications, forecasts, or occurrence listed in the definitions of risk classes.

Specific Action

Action by Localities

Administrative action should be taken according to BI class, visibility, and risk expected in each locality. ACTION MUST NEVER BE BASED ON AVERAGE BURNING INDEX CLASSES OR VALUES for the ranger district unless they are approximately similar at all fire danger stations. In determining administrative action, it is important to know what areas or zones are affected by the burning index class determined at each fire danger station.

Fuel Moisture Zones: Areas within the management unit which have more or less uniform moistures in common with a given fire danger station are termed a "fuel moisture zone." Complete instructions for preparing maps showing these zones are contained under "Preparation of Fuel Moisture Zone Maps" in this chapter.

Fuel moisture and wind velocity measurements should be taken at a fire danger station within a fuel moisture zone, and the burning index class resulting from the combination of these two factors should be applied to as much of the zone as the fuel moisture and wind velocity represents.

The lowest fuel moistures on the unit usually occur in the lowest elevation zone. There are frequent exceptions to this general rule. For example, dew may usually form at a given valley station, while a nearby station about 1,000 feet above the valley floor may have no dew because it is just above the layer of colder air that settles in valleys on still nights. During these conditions, the valley station may have much higher morning fuel moistures and slightly higher afternoon moistures. West of the Cascade summit when the night wind is easterly at high elevations alone, the lower stations usually have the higher morning fuel moistures, and these may remain higher through the day.

If readings from higher elevation zones are not available, approximate fuel moistures can be estimated from records of the fire danger stations located in the lower zones. Thus, in the spring, the need for protection positions in higher elevation country can be estimated. The same procedure will hold during the summer and early fall months, when rains have reduced the fire danger temporarily and positions in higher elevation zones have been vacated. After the effects of these rains are gone, the fuel moistures at the lower elevation zone will usually serve as a guide as to when the higher elevation positions should be remanned. While a given fuel moisture will serve as an indicator of conditions elsewhere, it alone cannot be depended upon for manning protection stations but must be supplemented by local observations of weather conditions such as cloud and fog layers, dew, high night temperatures and cool day temperatures.

<u>Visibility Zones</u>: Occasionally visibility conditions vary within a management unit. An area having similar visibility may include a group of lookout stations, and they are considered to be in a visibility zone of temporary nature. Detection for each fuel moisture or risk zone may be provided by lookout stations which are not actually located in those zones.

Risk Zones: Man-caused risk, such as industrial operations, recreation concentrations, and so forth, can be zoned into fairly definite areas. Changes in this risk can ordinarily be anticipated and planned for in advance by zones. Seasonal lightning risk cannot be zoned, since strikes may occur on any part of the unit, but action may be taken on lightning zones because of a forecast for a particular area or because a storm occurred in a particular area or zone.

Strength-of-Force Plans

In fire control management, each combination of burning index class, visibility and risk in a given locality requires a certain strength of force and course of prevention action for that locality. The BI, visibility and risk will seldom be the same throughout a Ranger District, and so plans for blanket application to the entire district will be of little value. Plans to show this strength of force should include the regular guard positions to be manned, occupancy of temporary lookout stations and vantage points, aircraft detection, crew action, patrols, industrial inspections, registrars, blasting restrictions, truck standby, burning permit restrictions, publicity and special action to take care of emergencies. These plans should set up the action proposed for as many of the 10 burning index classes as past experience, substantiated by fire danger records, indicates may be expected in each locality within a Ranger District.

These plans should represent the best possible combination of facts, pocled and measured judgment, and past experience for a ranger district. If they have been prepared correctly and carefully, they should contain nothing that cannot, under reasonable circumstances, be put into effect. All specific action details should be included in tabular form. These plans serve as check lists, for the district guard, ranger district clerk, headquarters fireman or others at the ranger district headquarters and should be as simple and realistic as is possible to make them yet contain all the necessary action planned for each comtemplated burning index class by zones.

A sample strength-of-force plan, for the peak of the fire season, is shown on Page II-5-9. Plans will be prepared on Form 88-R6.

Legend: To facilitate describing action in strength of force plans under various conditions, uniform symbols should be used. An appropriate legend is shown on Form 88-R6.

Statistical Information: Using past fire danger records for selected fire danger stations, average BI values and classes have been prepared by stations and by ranger districts. Information on the highest BI values for single stations, the range of values, and number of days in each have also been compiled and sent to each forest. This statistical information furnishes the base for preparing strength-of-force plans. As more information is gathered, it should be analyzed so the latest and best facts will be currently available for use.

Other basic information, such as seen area and suppression coverage maps, fuel type maps, fire occurrence maps, industrial hazard maps, and fire prevention and preparedness plans, should be referred to and used when deciding on action to be taken under various combinations of BI classes, visibility and risk.

Mechanics of Plan: Action to be taken by regular guards, temporary lookouts, emergency guards, and Forest Service crews can be appropriately shown in tabular form. Possibly some crew standby action should be described. Some types of action will require more description than others, for example, patrols, checking industrial operations, special closures, emergency registering, blasting restrictions, communication facilities, action by yearlong forest officers, issuing and revoking burning permits, and standby of trucks for fire duty. Some items should be referenced to maps and some to different sections of the fire prevention or suppression plan. Some items can be further classified or subdivided into prevention, preparedness and suppression activities.

All action in the strength-of-force plans should be based on BI classes, visibility and risk in the locality or localities affected by each action step. To be the most usable, the plans should include provisions for rapid changes in administrative action required by rerating the BI class, visibility or risk.

R-6 F.C. Hdbk. Revised 6-27-49 No. 54 (This Sample Illustrates Form and Generalized Minimum Action Only)

Sample Forest Year 1950 (Peak of Fire Season)

STRENGTH-OF-FORCE PLAN

Pine Ridge Ranger District

X - Position manned or action taken without further qualifications. V1 - Regular, 8 miles or batter visibility.
V2 - Emergency, 8 to 8 miles visibility.
V3 - Poor val'Allity, lookouts cannot see exclusive areas of risk.

3. Action phase of fire prevention plana;

R-6 F.C. Habk. Page Reviset 6/15/51 No. 63

District prev. plans Timter-sale contracts Clearing projects Special-use permits

E. C. C. N. D.

E. C. M. Unforeseen man-caused risk.

E. A. M. unforeseen man-caused risk.

E. Porecented or impending lightning storms of local nature in which safe a few cloud-to-ground strikes are observed.

E. General or every local lightning storms.

NAME . REGULAR	1			CLA	188 (F DA	Y		REGULAR GUARDS, EME				CL	ASS	OF D	AY		-1	ways can up =		1		C	LASS	OF D	AY		-
NAME - REDULAR FIRE GUARD POSITIONS	TITLE	1	2	3	4 1	8		7 8-10	NAME - EMERGENCY POSITIONS AND VANTAGE POINTS	TITLE	1	2	3	4	9		7	B-10	NAME - COOR AND REGULAR SUPP. CREWS	HEALE	1	2			5		7	8
	-			-	(A+						-						-	_		fember	ra	+	+	-				-
ZONE A Pine Ridge R.S.	RDA			1	pho	neil.	JA.	R.3.	ZONE A Lake Butte	VP	1	RA	V2	V2	23	R3	P3 1	DR.	Smith Creek Supp. Crew	4	10,	A D	4 R3	P3	pz	23	X	
10 11 11	RDC		X	X	X	X	X	X	Lake Butte	1		1	-	****	110	110	DE L		Jones Slash Crew	10	1	1	R4	R4	R3	R3	B3	i
H R H	P	(na)	R3	X	X	X	X	X J											South Butte Road Crew	6				R4	R4	R4	R3	E
11 th H	P	(Gn	R4	84	R3	847	X	X L	radic)							-5			TRACTOR SET SET									Ī
Anthill	L		A5	X	X	X	X	XX									-				1	-	1					Ī
Plateau	L		V 2	X	X	X	X	X			+	-					+	-			+	+	-	-			_	-
ZONE B	_				-	-	+	-	ZONE B	-	-	+			-		+		ZOUE D		+	+	+	-	-			-
Robin Hill	L		V2	Y	Y	Y	Y	Y I	Round Butte	VP		DA	V2	V2	D's	10.11	19.7	0%	Hansen Trail Const. Cr.	5					DA	R4	D4	
Anthill	L							X S		1		A	A	no.	The state of	Ad	ROLL	-	Manager Trail Const. CF.	- 2		+			In a	11.4	N-9	Ť
Whisky Ridge	P		R3	R3	X	X	X	X J																				i
							1	-																				i
	-				-	-	-	-			-	-					-				+	+	-	-				
	-		-	-	-	-	+	-		-	-	-	_	-	-		-	_			+	-	-	-				,
	1		-	+	-	-	+	-		-	-	-			-		-	-			+	+	+	+		-		
	+		-	-		-	+	-		-	-	-			-		-	-			-	+	+	-		-	-	
ZONE C	1			-		\rightarrow	-	-	ZONE C		-	-							ZONE C		+	+	+	_		-		ŕ
Robin Hill	T.		V2	X	x	X	x	X	Point A	EL			PS	V2	P.	VI R3	V2 1	V2	TONE									
Indian Butte	L		R3	R3	X	X	X	X 2	To all the second secon					-	-			-			1							í
Monument	LF		R3	R3	R3	R3	X	X X																				ĺ
																												0
						-	-	-				-					-				1	1	-					
	-			-	-	+	+	-		-	-	-					-	_		-	+	+	+		-			,
	-		-	-	-	+	+	-		-	-	-					-	-			+	+	+	+		-		ŕ
	1		-	-	-	-	+	-		-	-	-	-				-	-			+	+	+	+				ŕ
				-	1	-	1			1							1			-	+	+	+					i
							1														1	+	1					
																												-
																						I						ĺ
ZONE D									ZONE D										ZONE D		1	T					7	
The state of the s				-	-	-	+			-	-	-					-			_	-	-	+					1
	-		-	-	-	-	-	-		-	-					\vdash	-	-			+	+	+	+		-	_	-
				-	-	+	+	+	1		-						+				+	+	+	+	-	-	-	-
					-	+	1	+			-	-					-	-		-	+-	+	+	+	-			r
The Part of the Pa					-	1				-										1	1	+	+	-				-
					1		1															1					10	ī
							1																					ī
																						T						Ī
	-			-	1	-	1	-																				Ī
			-	-	-	\rightarrow	+	-		-	-	-									-	-	-	-		-		_
ZONE E									ZONE E										ZONEE	*		1						
	-		-		-	+		-			-	-	-			-		-		11.57	+	+	+	-		-		r
			-	+	1	-	+										1			,	+	+						r
				1	1	1	+														+	1	+	1				r
				1	1																	+	+					Ü
	1			-	-		1															1						
									ADDITION	NAL REC	DUIF	EME	NTS															
SPECIFIC ACTIVITY OR ACT				CLA	188 0	P DA	Y				T		CI	ASS	OF D	YAC		-		_	T		- (CLASS	OF	YAY	_	-
THE RESIDENCE ACTIONS OF ACTO	IUN	1	2	3	4	8	•	7 8-1	SPECIFIC ACTIVITY OR ACTI	ON	1	2	3	4	8	6	7 1	8.10	SPECIFIC ACTIVITY OR ACTIO	М		2	2 3	4	8	8	7	ĺ.
District Co. 1	-		-	-	-	+	+	+			-	1	-	-	-		+	-			-	+	+	+	-	-		1
Ranger District Clerk alternate will notify	forest		-	-	+	+	+	+	4. Patrols: Road (Specify)	_	+	+	17.76	112	17.3	V.3	17.9 1	273	7. Industrial operat: Inform and aler	Longy	+	+	+	X	-			H
officer responsible for	or			1	1	1	+	1	Reilroad speede	n	1		42	V 52	A S	V.2	AS IA	0	Extra patrol, w		+	+	+	+	X	A	-	t
securing action;	V.		1				+		Following tra	ins	1	X	X	x	x	x	x	Y	man, etc.	T.C.F.	+	+	US	V2	Y	Y	Y	r
				1		1	1		Other	200		10	V3	V3	V3	X V2	V2	X	Close down	The Late			100	186	1	-	X	r
1. Fire conditions:									Berry patches d	uring										· ·			1					ľ
DR - RDA - TSO			- 1	R/I	2	12	X	x x	harvest				X	X	X	X	X	X				1						ĺ
Supervisor			-	F	R4 1	3	X	XX	Airplane	13.3								10			-	-	_	-	-	-		ļ
Cooperators			-	F	34 1	34 B	4	XX		htning	-	-					-	_			-	+	+	+	-			ļ
		-	-	-	-	+	+	-	storms		-	X	X	X	X	X	X	X.	8. Special fire equipatendby:	pment	-	+	+	+	-			ł
		+	-	+	+	+	1	+	Regular patro		+	-	-		X	X	X	X	Pine and mi	and	+	+	+	+	-		-	ŀ
			-	+	+	1	+	-			1	1			-	1	-		Fire cat, plow.	and_	+	2	4 R3	-	V	v	v	f
2. Check of calls fo	rom reg			1	1	1	+	1			1	1							Tankers, 1-1/2	ton	-	R4	1 RA	R3	X	X	X	İ
prot. force and forest	t work			1	1		1				1						1		Horse truck			R	4 R4 4 R4	Y	Y	X	X	ĺ
Pewst					1			1	5. Blasting:								1		1123.4 21441			1		1				J
Norning-Moon-Eve	ening			X	X	X	x		Without restric	tions	X																	ſ
Hourly - accord	ing to								With electric c													I						ĺ
schedule				F	84 1	34 B	4	XX	watchmar 1 ho	ar		X	X										1		1			ĺ
			1	-	-	-	+		Rock cuts with	electr	10	-							9.		-	1	+	-	-			ļ
		-	-	-	-	-	+	-	caps and wate	bman	-	-			-		-				-	+	+	+	-	-		ļ
	-		-	+	+	+	+	-	1 hour		X	X	X	X	-	x	-	-			+	+	-	+	+			ļ
									No blesting									Y										

XXXXX

II-5-9

Manning Positions: Since the basis for all manning is to be taken by B.I. classes and zones, regardless of the time of year, detection positions which provide exclusive coverage for a given zone will be required when the fire danger in that zone justifies detection or suppression protection for a day or portion of a day. The same principle applies to all other types of positions and activities. Ranger district B.I. averages should not be used as a base for manning unless all fire danger stations have approximately the same value or class.

The plan for manning should provide for a build-up of the strength of force from skeleton protection in the spring to full regular force by the time the intensive fire season arrives as indicated by the B.I. class and normal risk. Fire danger that warrants organized protection usually starts first in the lower elevation zone and gradually works into the higher elevation zones. Some strength of force will be necessary as soon as B.I. classes 1 or 2 are reached, provided the risk or visibility factors make such action necessary. As the B.I. classes become higher, the intensity of protection is increased until all regular, emergency and cooperator personnel are available for immediate dispatching to fires. Eventually as the peak of the fire season is reached, all regular personnel positions will be manned solely on the basis of the B.I. class and usually without qualification as to man-caused risk and visibility. The force should be scaled up or down as fire danger increases or decreases day to day or for portions of days.

The plan for manning should be realistic in the use of regular protection personnel, other Forest Service personnel, and cooperators, and should be prepared on the basis that it is to be followed when there is danger from fires. Unreasonable or impossible action should not be indicated.

Protection stations manned to protect a given zone may not necessarily be located in that zone. This will often be true of positions whose exclusive detection coverage involves the lower elevation zones, or whose suppression coverage within an acceptable time limit for a rate of spread fuel type involves areas that are situated in a lower elevation zone.

Headquarters or administrative positions cannot always be manned according to the B.I. class for the zone in which they are situated because their services are often rendered in all zones.

Expansion in manning beyond regular positions will vary with critical conditions caused by abnormal B.I. classes, Class 2 or 3 visibility, and class 2, 3, or 4 risk. High B.I. classes call for effective prevention effort and for more vigorous action on fires that do start. Poor visibility requires patrols, use of temporary lookouts, and additional checks of mancaused fire-starting agencies. Severe lightning storms call for full detection coverage by lookouts, by use of vantage points, or by aerial reconnaissance, standby suppression crews at transportation hubs, and other measures. Preparedness action on the part of the ranger should be indicated, including any required standby on bad fire days. Many other examples are obvious as applied to each management unit in order to obtain the maximum effectiveness from all available resources on fire control activities as well as the contribution of the time of fire control guards to other activities.

R-6 F.C. Hdbk. Revised 6-27-49 No. 54 Action on Specific Activities: Plans for action on specific activities, such as checking and inspecting industrial operations, should be definite and complete. Action should progressively tighten up as the B. I. class increases. The same philosophy should be applied to all preventative measures. For instance, as visibility reaches class 3, a lookout-fireman should in many cases be patrolling and checking forest users in his vicinity.

Preparation of Fuel Moisture Zone Maps

Fuel moisture measured at only one fire danger station within a management unit generally does not represent fuel moistures throughout the entire unit.
Averaging fuel moistures from a low elevation fire danger station and a high elevation station may result in incorrect fuel moisture reading for both areas.
Following this reasoning, the areas which have more or less uniform fuel moisture
in common with a given fire danger station should be identified with that station.
Such areas are termed "fuel moisture zones".

The work of preparing fuel moisture zone maps is divided into two steps which should be followed in the following order:

Step 1. Analysis of Past Fire Danger Records

Records to be Used: The analysis should be restricted to July and August records for those years in which the same fire danger stations to be analyzed have been in use. At least two years records, preferably the records for four or five years, should be used. If the locations of the fire danger station have been changed materially in successive years, it may be difficult to secure a complete analysis.

Tabulating the Records: The lowest fuel stick moisture content for each day at each station should be entered in the appropriate place on the Fuel Moisture Zone Map form. A sample showing the fire danger station analysis for a ranger district may be found on page II-5-14. Data for all months and years should be recorded on the same form. Omit any day's record from a fire danger station where the lowest fuel stick moisture reading is lacking. The 4:30 p.m. will usually be the lowest; however, where a reading is missing, reference to data taken at other fire danger stations will indicate if the lowest reading is missing.

Computing Values: For each fire danger station, multiply the number of days opposite each fuel stick percent by that percent. Thus, if there are ten entries for a fire danger station opposite a 4% fuel stick, the value will be 40.

(Continue on II-5-13)

Computing Averages: Total up the several values for each fire danger station and divide by the total number of entries for that station, carrying the result to the nearest two decimal places.

Determining the Zone for Each Fire Danger Station: Only five fuel moisture zones are used, and each is identified on the base map by the standard color indicated for it. The zones are as follows:

Zone	Fuel Moisture Average	Color
A	5% or less	Lake Red Dixon $321\frac{1}{2}$
В	Over 5% to 7%	Pink " 322
C	" 7% to 9%	Orange " 324
D	" 9% to 11%	Blue " 350
E	" 11% to 13%	Green " 354

If the average of a fire danger station is not more than 5.09, 7.09, 9.09, or 11.09, it may be assigned to the next higher ranking zone, if it is believed desirable to do so. Thus, on the enclosed sample form you will note that Silvertip Lookout has an average of 7.09, or Zone C, but it has been assigned to Zone B because it was believed that from the standpoints of elevation range, forest type, and aspect it properly represents the higher ranking zone.

Higher elevation fire danger stations frequently have broken records. These broken fuel moisture records may result in an average that is much lower than it should be, and it may be necessary to arbitrarily ignore the average and assign such stations to lower ranking zones solely on the basis of judgment. On the sample sheet Brown Bear has an average of 7.14 but was arbitrarily assigned to Zone D. This was done because the station was not manned during 45 days, most of which were damp days, and in addition its location as to elevation and timber type substantiates this change.

Step 2. Delineation of the Fuel Moisture Zones

How the Limits of Each Zone are Determined: Each district ranger should delineate the boundaries of the zones on the basis of judgment of fuel stick moisture conditions on the district, supplemented by elevation ranges, forest type, and general aspect. Each zone should be of 1,000 acres or more. The driest zone as indicated by the analysis of the fire danger station records (Step 1) should be drawn in first. The zone may be all in one piece, or it may be in several pieces of 1,000 acres or more. Narrow strips of less than a quarter of a mile should not be shown. After completing the driest zone, the other zones are outlined by the same process.

(SAMPLE)

FUEL MOISTURE ZONE MAP ANALYSIS FORM

FOREST: Kodiak

DISTRICT: Black Bear

PERIOD: July, August-1938, 1939

Fuel Stick	Stick R.S. L.O.				Pant		Lynx Cree		Blac Horn	100	L.O.	er Tip	Ĺ.O.		G.S.		Otter G.S.		
60	Days	Value	Days	Value	Days	Value	Days	Value	Days	Value	Days	Value	Days	Value	Days	Value	Days	Value	
_ 2	3	6																	
3	28	84																1	
4	39_	1.56	4	16	6	24					3	12			13	52			
5	32	160	22	110	39	195	2	10	24	120	20	100	5	25	43	215	1	5	
6	12	72	28	168	29	174	13	78	36	216	29	174	15	90	30	180	30	180	
7	5	35	16	112	20	140	33	231	22	154	25	175	15	105	7	49	30	210	
8	4	32	6	48	7	56	10	80	20	160	20	160	8	64	6	48	24	192	
9			12	108	3	27	10	90	7	63	11	99	10	90	1	9	12	103	
10	1	10	5	50	_ 3	30	6	60	5	50	3	30	7	70			5	50	
11			11	121			5	55	3	33	1	11	7	. 77			1_	11	
12			5	60	1	12	2	24	1	12	2	24	3	36			1_	12	
13+			12	156		4	3	39	3	39	4	52	9	117					
Total	124	555	121	949	108	658	84	667	121	847	118	837	79	564	100	553	104	768	
Avera	ge	4.48		7.84		6.09		7.94		7.00		7.09	7.	#7.14		5.53		7,38	
Zone		A		C		В		C		В		В		' D		В		C	

^{*} Average is so close as to justify placing in Zone B. Forest Type, Elevation, and Aspect also indicate that Zone B is justified.

[#] This station was not marmed during damp weather. There are 45 days when there were no records, and during this time many of the days were damp. Supporting data justifies placing this in Zone D.

On some districts the distribution of the fire danger stations may be such that the analysis will not provide data for certain zones which are believed to exist. In such cases it will be necessary for the district ranger to rely on judgment as to their boundaries.

It should be expected that only a few districts will have all five zones, and often an intermediate zone will be omitted. The range of climate necessary to produce five zones on one district is seldom present, and very steep rises in topography account for the omission of intermediate zones.

Non-Forest Land: The boundaries of non-forest land, such as agricultural land, barrens, and similar types should be delineated but left uncolored. Grass lands should be placed in the zone in which they belong.

Map Scale and Size: A half-inch map is preferred. Maps should be atlas size, 18x2l inches, so they can be inserted in the Ranger District Fire Control Management binder.

Finishing the Map: The map should be colored and rubbed. A legend showing the zones present on the map should be added, and the location of the fire danger stations indicated. It would also be well to show the average of the fuel moisture of each fire danger station on the map to serve as a reference.

Fire Danger Stations

Since fire danger stations are the sole source of data used in determining most of the fire danger factors, careful consideration should be given to their location and operation.

Location

Proper distribution and location of fire danger stations is not possible until fuel moisture zones have been established. If zone maps have not been made, approximate zones can be shown on a base map. One fire danger station will usually provide sufficient information for each zone.

Distribution of fire guards may not permit a fire danger station within each zone. A fire danger station should, if possible, always be located where a sampling of the lower elevation zone is provided; higher elevation zones can generally be sampled due to lookout positions. For zones without fire danger stations it will be necessary to interpolate between existing higher and lower elevation stations in order to approximate their fuel moistures and wind velocities. In averaging the burning index values for the existing fire danger stations, interpolated data would, of course, be omitted.

In selecting the location of a fire danger station within a zone, the protective position should be utilized that will assure a true sampling of that zone and provide reasonably complete records.

Equipment

A fuel moisture indicator stick scale, a set of $\frac{1}{2}$ " fuel moisture indicator sticks (new each year), and a wind gauge comprise the minimum equipment required at a fire danger station. In no case should this minimum equipment be divided between two different positions, since burning index values cannot be computed unless both fuel and wind data are available.

There should be one psychrometer, preferably fan-type, in use on each ranger district. One instrument should usually be located at the district ranger's headquarters. Rain gauges and wind vanes are optional but desirable equipment. Either a standard metal vane or a home-made wooden vane may be used.

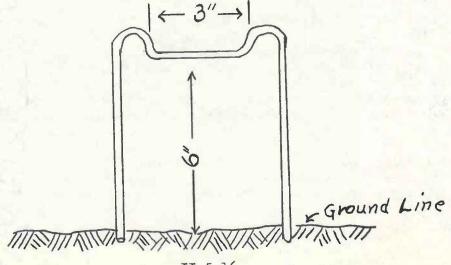
Placement of Instruments

For the stations selected the exact location of the instruments is very important. Full exposure of the fuel sticks to sunlight during the longest number of hours, regardless of the cover type, and unrestricted access of the wind gauge to prevailing winds is the objective, even though this may result in inconvenience in taking the readings. Any distance from the guard station that will not require more than a 15-minute round trip is a reasonable consideration in selecting the location of the instruments.

The fuel sticks and wind gauge may be placed at different locations in the general vicinity of the same guard station if it is not feasible to get full sunlight exposure and unrestricted access to prevailing winds at the same location.

Fuel Moisture Indicator Sticks: Wire supports, exactly six inches above the ground, should be used for the fuel sticks. Plants should not be allowed to shade or grow up against them, and if possible, the sticks should be located where dust caused by travel on roads and trails will not settle on them.

The wire supports may be made from two pieces of #9 galvanized telephone wire. Each piece of wire should be approximately 30 inches long, and bent, as shown in the following diagram.



R-6 F.C. Hdbk.

Fuel Stick Scales: When no standard instrument shelter is available, the scales may be mounted on a tree or post in a sheltered spot, but they should be protected from the weather by a shelter constructed from materials readily available. If a garage or other building is convenient, the scales may be mounted inside.

Wind Gauge and Wind Vane: The instrument should be at least 100 feet from buildings or other objects that obstruct the free movement of air currents, and mounted on a pole exactly 10 feet above the ground. To comply with these instructions, the instruments may be located up to 1000 feet from the buzzer, provided number 14 weather-protected wire is used with at least three telephone batteries. The instrument should not be placed on top of a sharp mountain peak or ridge or near other distinct changes in topography where local convection currents unduly affect wind velocities. The objective should be to measure the average general wind velocities and not local conditions which affect only a very small portion of the ranger district.

Psychrometer: If an instrument shelter is used, the psychrometer should be located near the fuel sticks. If no instrument shelter is used, relative humidity readings should be taken in a similar area but not in direct sunlight.

Operation

It is important to maintain complete, legible, and accurate records of all fire danger stations. Complete readings should be made at all occupied fire danger stations at 8:00 a.m., 12 noon, and 4:30 p.m., standard time. Any gaps in the record will greatly impair the operation of the fire danger rating system. What do they do on the day is heliday.

Fuel Moisture Sticks: If fuel moisture sticks are exposed at different dates during the spring, a precise comparison between the summer records of the stations cannot be made because during the spring rains the sticks lose part of their dry weight. Therefore, all fuel moisture sticks for summer use should first be exposed not earlier than June 25. The first records from these sticks should begin not less than five days after exposure to allow time for stick to become adjusted to local weather.

An extra fuel moisture stick should be requisitioned for use at the station where earlier records are desirable. This extra stick should be destroyed when summer stick records are started. The summer stick should be destroyed at the close of the season for the reason stated above.

The same side of the stick should always be exposed to the sum. If the side exposed to dew at night is turned down after the morning reading, the stick will not dry out as rapidly as when the damp side is turned up to the sun. In such cases, day-to-day readings, especially those at noon, will not be consistent even though the weather conditions are the same.

Keep the sticks clean and handle them with clean hands. If pieces break off the sticks, replace with a new set. The sticks must be left outdoors on the wire supports except when being weighed.

Revised 6-27-49 No. 54

R-6 F.C. Hdbk.

The moisture content of the sticks shows directly the combined effect of temperature, relative humidity, wind, rain, dew, and fog upon the relative inflammability of comparable fuels.

Fuel Stick Scales: Make sure each day that the scales are in a vertical position and that the pointer coincides with the "O" mark when the test weight is hanging on the loop. The test weight should not be left hanging on the loop as it causes excess wear on the scale beam. If the scales are rigidly attached to a tree, building or firmly set post, they will seldom get out of a vertical plane, if the pointer does not coincide with the "O" mark when using the test weight, the instrument can be correctly adjusted through loosening the wing nuts and shifting the face of the scale. Always read the scale to the nearest full percent: i.e., if the scale registers 5½ percent, this should be recorded as 5, but if the scale registers 5-3/4 percent, this should be recorded as 6.

Wind Velocity: The following procedure for measuring wind velocity should be followed:

If the wind gauge is the type having three spokes and is marked "1938 Model", be certain that the wind velocity table marked for wind gauge "Model 2B3C" is used.

If the wind gauge cups are not moving, report the wind as zero. Adhere closely to the printed directions on the velocity table and do not report fractional winds; i.e., report a 5-mile wind, not a $5\frac{1}{2}$ -mile wind.

Since the wind velocity often differs greatly from one minute to the next while fire danger rating is intended to represent conditions prevailing for at least an hour, a rating based on a one-minute or two-minute wind measurement is liable to be misleading. Tests have shown that four-minute measurements are much more representative. At low-elevation stations, or other locations where the wind velocity seldom exceeds 10 M.P.H., a four-minute measurement should be made at each observation time. At high-elevation stations, or at any other station where the wind often exceeds 10 M.P.H., two four-minute measurements should be made one-half hour apart and the average velocity for the two periods should be recorded; the first measurement should be taken one-half hour before the regular reading time and the second at the regular reading time. Thus, at the 4:30 p.m. reading there would be one measurement at 4:00 p.m. and another at 4:30 p.m.

The standard R6 4-cup or 4-half cylinder cup gauges and the Chisholm 3-cup gauge were originally designed for 2-minute measuring periods. When making a 4-minute measurement, divide the number of buzzes by 2 before obtaining the miles of wind velocity from the wind velocity table designated for 2-minute measurements. The Friez gauge, which the U.S. Weather Bureau supplies for some of its cooperative stations, and the Roger gauge were designed for a 1-minute measuring period. When making a 4-minute measurement with these gauges, divide the number of buzzes by 4. The result is the wind velocity. Tables that give directly the velocity for a 4-minute measurement period can be obtained from the Pacific Northwest Forest and Range Experiment Station.

Wind gauges should be oiled only with the high-grade oil obtained from the regional supply officer for this particular purpose. The ordinary light mineral oils sold as household lubricants are corrosive and will gradually pit small ball bearings. About six drops of oil once a month is sufficient for the R6 4-cup and Chisholm 3-cup gauges; other types will require less. The wire connections between the wind gauge, buzzer, and batteries should be frequently cleaned to insure good contacts.

On the wind gauge with 4 spokes and half-cylinder cups, the cups should be exactly 3-13/16 inches across the face. If the cups should become bent, they should be adjusted to this dimension.

The cups should be permitted to run free at all times and should not be stopped or hindered by home-made devices.

Visibility: Visibility can be determined by either a visibility meter or by ocular estimation.

Measurements with Visibility Meter: The visibility distance can be accurately determined by a visibility meter (instructions in the box), with which at least one lookout on each ranger district is equipped.

Measurements by Ocular Estimation: If not provided with a haze meter, the lookout should estimate the visibility distance toward the north, south, east, and west, and then average the four distances (omitting from the average any directions cut off by topography or timber). Keep in mind that the visibility is based on the distance that smoke could be seen from a fire about 10 x 20 feet.

Blue-white smoke can be seen farther against a timber background than against a light-colored, snag background, or against a brush field. A standard background should be chosen for each of the directions for which a visibility estimate will be made. This choice should be based on the type of background which predominates in a given direction. Thus, if to the north a green timber background is taken as standard, observations should always be based on a green timber background when estimating visibility in that direction.

Careful measurements have proved that smokes in full sunlight can be seen as far when the observer is looking toward the sun as when looking away from the sun. This is the opposite of what might be expected, since dark objects such as ridges and trees cannot be seen as far when looking toward the sun through a hazy atmosphere as when looking away from the sun. This means that a smoke column penetrated by the direct rays of the sun is illuminated and takes on visibility characteristics greater than its hazy background. A smoke in the shadow of a ridge has visibility characteristics more like ridges of trees and cannot be seen as far when looking toward the sun. These facts should be given consideration when estimating visibility toward the sun.

R-6 F.C. Hdbk. Revised 6-27-49 No. 54 On many lookouts there are permanent or semi-permanent smokes which will assist in determining the estimated visibility distance. Thus, a train passing a certain point each day would serve as a check, or smoke from a sawmill would serve. In any case, ocular estimates of visibility distances should be made by some careful procedure rather than merely by an offhand guess.

Designated lookouts should report estimated visibility distance, which will be included with measured distances in determining the district average. Where measured distance varies greatly from estimated distance, it would be well to check on the procedure of each lookout to make sure that he is not making outright guesses. Low elevation guard and ranger stations should not be used to determine visibility.

Relative Humidity: Relative Humidity is one of several weather factors that influence forest fire fuel dryness. While it is not used to determine the B.I. value and class or to describe conditions requiring specific action, It is valuable along with the fuel sticks in fire protection. Fuel stick readings show the trend of dryness of small fuels or the surfaces of logs and snags resulting from all weather factors. For example, comparison of fuel stick readings from one day to the next or from noon to 4:30 p.m. will show whether forest fire fuels are becoming drier. The amount of this change on different days shows the comparative rates of drying. Owing to the density and thickness of fuel sticks, they do not dry out or gain moisture as rapidly as dead bracken, leaves, and grass. These fuels closely follow the rate of change in relative humidity. The fuel sticks are not weighed with sufficient accuracy to show the precise time that the moisture content changes from a downward to an upward trend in the afternoon. This change in fuel moisture trend usually occurs at the time the relative humidity begins to rise.

Relative humidity trends, therefore, provide the administrator with valuable information on changes to be expected in the trend of all fuel moistures, and the rate of relative humidity increase or decrease indicates the rate of moisture increase or decrease in dead bracken, leaves, and grass. This information is particularly important for areas where these fuels predominate and in planning attacks and taking action on large fires.

Supplies, Repair, Replacement and Storage of Equipment

For procedure on requisitioning supplies and repair, replacement, and storage of equipment, reference should be made to the Manual (NF-A3-7).

See page II-5-22 for instructions on supplies and repair for stations cooperating with the U. S. Weather Bureau.

Fire Danger Instruments: Oil and dust may gradually form a gum on the bearings of wind gauges, which will increase the friction and cause readings below the true velocity, especially during very light winds. The cups should turn whenever a light breeze moves nearby green leaves or weeds or can be felt for a minute or more. To determine if a demounted gauge turns freely, hold it above your head in a room where there is no draft and walk rapidly. Keep the shaft vertical. The cups should begin to turn by the time you have walked about 10 feet. If the gauge does not turn freely, the

R-6 F.C. Hábk. Revised 6-27-49 No. 54 Wind gauges should be oiled only with the high-grade oil obtained from the regional supply officer for this particular purpose. The ordinary light mineral oils sold as household lubricants are corrosive and will gradually pit small ball bearings. About six drops of oil once a month is sufficient for the R6 4-cup and Chisholm 3-cup gauges; other types will require less. The wire connections between the wind gauge, buzzer, and batteries should be frequently cleaned to insure good contacts.

On the wind gauge with 4 spokes and half-cylinder cups, the cups should be exactly 3-13/16 inches across the face. If the cups should become bent, they should be adjusted to this dimension.

The cups should be permitted to run free at all times and should not be stopped or hindered by home-made devices.

<u>Visibility:</u> Visibility can be determined by either a visibility meter or by ocular estimation.

Measurements with Visibility Meter: The visibility distance can be accurately determined by a visibility meter (instructions in the box), with which at least one lookout on each ranger district is equipped.

Measurements by Ocular Estimation: If not provided with a haze meter, the lookout should estimate the visibility distance toward the north, south, east, and west, and then average the four distances (omitting from the average any directions cut off by topography or timber). Keep in mind that the visibility is based on the distance that smoke could be seen from a fire about 10 x 20 feet.

Blue-white smoke can be seen farther against a timber background than against a light-colored, snag background, or against a brush field. A standard background should be chosen for each of the directions for which a visibility estimate will be made. This choice should be based on the type of background which predominates in a given direction. Thus, if to the north a green timber background is taken as standard, observations should always be based on a green timber background when estimating visibility in that direction.

Careful measurements have proved that smokes in full sunlight can be seen as far when the observer is looking toward the sun as when looking away from the sun. This is the opposite of what might be expected, since dark objects such as ridges and trees cannot be seen as far when looking toward the sun through a hazy atmosphere as when looking away from the sun. This means that a smoke column penetrated by the direct rays of the sun is illuminated and takes on visibility characteristics greater than its hazy background. A smoke in the shadow of a ridge has visibility characteristics more like ridges of trees and cannot be seen as far when looking toward the sun. These facts should be given consideration when estimating visibility toward the sun.

R-6 F.C. Hdbk. Revised 6-27-49 No. 54 On many lookouts there are permanent or semi-permanent smokes which will assist in determining the estimated visibility distance. Thus, a train passing a certain point each day would serve as a check, or smoke from a sawmill would serve. In any case, ocular estimates of visibility distances should be made by some careful procedure rather than merely by an offhand guess.

Designated lookouts should report estimated visibility distance, which will be included with measured distances in determining the district average. Where measured distance varies greatly from estimated distance, it would be well to check on the procedure of each lookout to make sure that he is not making outright guesses. Low elevation guard and ranger stations should not be used to determine visibility.

Relative Humidity: The following precautions should be taken to make accurate relative humidity measurements:

- 1. Keep the wet bulb wicking clean—do not touch it. Replace it when it becomes slightly soiled.
- 2. Use clean water on the wet bulb. Change the water in the fan psychrometer reservoir or supply bottle at least once a week. Rainwater is recommended for hardwater areas.
- 3. With a sling psychrometer stand in the shade and face into the wind. Body heat and sunlight affect the accuracy of the readings.
- 4. The psychrometer should be whirled or fanned about 30 seconds before the first reading is made. The average sling psychrometer should be whirled $2\frac{1}{2}$ revolutions per second.
- 5. Always read the wet bulb first.
- 6. Read again after whirling or fanning for another 10 or 15 seconds.

 Repeat until the wet bulb is at its lowest point on two successive readings. Determine the relative humidity from the last of these readings of wet and dry bulbs.
- 7. When the wind speed is at least 10 miles per hour, the sling psychrometer may be held with bulbs pointed into the wind without whirling.
- 8. Since R. H. tables differ for different elevations be sure to use the correct table. Avoid using the dew point table by mistake.
- 9. In using tables that require a computed difference between the wet bulb and dry bulb readings check the subtraction.
- 10. Do not lay a sling psychrometer where it will be in direct sunlight. In bright sunlight a table top, car seat, black log, etc. often becomes very hot and the thermometer mercury may expand until it breaks the bulb.

Supplies, Repair, Replacement and Storage of Equipment

For procedure on requisitioning supplies and repair, replacement, and storage of equipment, reference should be made to the Manual (NF-A, Title 6, Chapter 5).

For instructions on supplies and repair for stations cooperating with the U.S. Weather Bureau, refer to "Stations Cooperating With the U.S. Weather Bureau" in this chapter.

Fire Danger Instruments: Oil and dust may gradually form a gum on the bearings of wind gauges, which will increase the friction and cause readings below the true velocity, especially during very light winds. The cups should turn whenever a light breeze moves nearby green leaves or weeds or can be felt for a minute or more. To determine if a demounted gauge turns freely, hold it above your head in a room where there is no draft and walk rapidly. Keep the shaft vertical. The cups should begin to turn by the time you have walked about 10 feet. If the gauge does not turn freely, the bearings should be cleaned and lubricated. This work should not be done at field stations, because the internal electrical contact points on some types of gauges will be bent out of adjustment if the parts are not properly aligned during reassembly. A mechanic with instructions or experience concerning this mechanism should do the work at district or forest headquarters.

At the conclusion of the fire season, all instruments should be carefully examined. If found to be in good condition, they may be stored at the guard or ranger station, or taken into the district headquarters, according to local practice. If any instrument needs repair, the nature of the repair work should be noted on an attached tag and the instrument taken into headquarters. Before transporting any of the fragile instruments, they should be carefully packed. Wind gauges should be complete less buzzers, wire, switches, and batteries when sent in for repairs. If one of the thermometers of a psychrometer is broken, the undamaged one should be sent in so it can be matched. The fuel stick scales should be oiled with a light coat of mineral oil to prevent tarnishing. The wind gauge should never be left out during the winter storms. Instrument shelters will have a longer life and require less maintenance if stored inside when not in use. Observations will be more accurate if the shelters are kept white.

Records and Reports

Fire Danger Rating Assembly Record (Form 82-R6, revised June 1951)

On this form are entered the daily estimates of expected fire danger used to determine strength-of-force needs. It is likewise a record of observed fire danger conditions. These records are also used for research and should be as complete as possible.

R-6 F.C. Hdbk.
Entire Page Amended 6-24-52
No. 70

Order of listing stations: In both upper and lower sections of the form, fire danger stations should be listed by fuel moisture zone starting with zone A. They should be listed in the same order every day and if the ranger station is a fire danger station, it should be the first listed within its zone. This allows rapid tallying of the readings for a given station without referring to the name column on every sheet when computing seasonal averages or making other tabulations. It is suggested that at the beginning of the season the station names be entered on the forms for the entire season.

Advance Estimates of Today's Danger:

Last night's estimate: When the afternoon readings and weather forecast for the next day are received, estimate and enter for each fire danger station the wind speed and fuel moisture expected at the time of that station's highest burning index. Similarly for each station, estimate and enter the expected minimum relative humidity. Then enter the corresponding B.I. Class for each zone. Enter for each fuel moisture zone the visibility class expected at the time of worst visibility, and the risk class expected at the time of highest risk. For methods of estimating these values, see "Advance Estimates of Fire Danger" in this chapter.

This morning's estimate of today's danger: The morning estimate of the day's fire danger is based on the morning fire-weather forecast and observed conditions. Entries are similar to those made for the evening estimates.

Today's measured danger: At 8:00 a.m., noon, and 4:30 p.m., standard time, enter wind direction and speed, fuel moisture, B.I. value, and relative humidity for each fire danger station. Also enter the visibility distance from each lookout point assigned to estimate visibility. (On the first form for the season, write a note to show which stations used haze meters to measure visibility. This is needed for later studies.)

Burning Index Value: Two burning index value tables are used (refer to "Integrating Burning Index Factors" in this chapter)—Table No. 1 for the spring and until July 15, provided herbs and grasses have not already reached the curing or dead stage, and Table No. 2 for early summer after herbs and grasses reach the curing or dead stage and in all cases after July 15 to the end of the season.

Highest station B.I.: At 4:30 p.m., standard time, enter the highest B.I. value observed during the day for each station.

Average zone B.I.: At 4:30 p.m., standard time, where there is more than one fire danger station in a fuel moisture zone, average the highest station B.I.'s for that zone as shown in the previous column and enter the average in this column. If there is only one station in the zone, copy the highest station B.I. in this column.

Zone B.I. Class: Enter the B.I. class corresponding to the average zone B.I. at 4:30 p.m.

Rain: At 4:30 p.m., Standard Time, enter the total rainfall occurring during the preceding 24-hour period at each fire danger station equipped with either a Weather Bureau or a Forest Service rain gauge.

Lightning over district: Enter a check mark under "yes" or "no" to show whether or not lightning occurred anywhere on the district during the 24-hour period ending at 4:30 p.m., Standard Time. This is the only record of thunderstorm occurrence in specific areas and is very important. If available, this information should be recorded even though no fire danger stations are manned.

U. S. Weather Bureau's fire-weather forecasts (back of form):
Both afternoon and morning fire-weather forecasts should be entered in
the space designated on the back of the 82-R6. To avoid having to turn
the sheets frequently while preparing a danger estimate from the forecast copies on this form, the forecast may be entered on the form back facing
the data of the day to which it pertains. Be sure to enter the
indicated dates on the forecast form to avoid errors when the forecasts
are used in later studies. Any supplementary warnings should also be
recorded together with time of receipt and the initials of the recipient.

Breaks in station records: On days during the period of use for a station when no one is present or on duty to collect data and there is a break in the record, the person filling out Form 82-R6 should list the name of the station and indicate on the line opposite whether or not the weather at the station was "rainy", "cloudy", "foggy", or "normal", etc. This will later allow more accurate determination of the seasonal and monthly weather averages used in strength-of-force planning. Otherwise, the records may be useless when computing seasonal averages because it is not known if the average or only the wettest or driest weather was recorded.

At close of season: The original copy should be sent to the Pacific Northwest Forest & Range Experiment' Station immediately after the close of the fire season.

Burning Index Record

Burning index records should be maintained for each ranger district on Form 84-R6. Show daily highest zone B.I. class, using color scheme listed on form.

Fire Danger Station Description - Form R6-F6

Whenever a new fire danger station is established or the location or exposure of an old station or any of its instruments is changed, Form R6-F6, Fire Danger Station Description Form will be completed in duplicate. One copy goes to the Regional Forester and one remains on the forest. Be sure that all items affecting anemometer and fuel moisture stick exposure are noted. Give the exact elevation if known, otherwise show the approximate elevation and mark it "estimate".

(SAMPLE)

FIRE DANGER RATING ASSEMBLY RECORD ADVANCE ESTIMATES OF TODAY'S DANGER

0

DISTRICT

YEAR: .. 1952 ... MONTH AND DAY: ... JULY . 17 ..

FIRE DANGER STATION	الدا		LAST	NIGHT 0 S	ESTIMA:	TE			THIS MORNING'S ESTIMATE								
	ZONE	WIND	REL. HUMID.	FUEL MOIST.	1	AVE. ZONE BI	ZONE BY		1	WIND	REL. HUMID.	FUEL MOIST.	BI	AVE.	ZONE BY	VIS. CLASS	RISK
TROUT R.S.	В	5	25	5		17	5	٧ì	RI	7	35	7		15	4	VI	RI
														4			
SAMPSON G.S.	С	5	25	6	13					5	35	7	9				
SQUARE TOP L.O.	C	14	35	8	8 A.M. 25					1.6	35	8	8 A.M.		La		
					38	19	5	VI	RI				43	22	5	٧Ì	R3
ALPINE PK.	D	10	45	8		16	5	V2	R3	10	55	11		3	2	VI	R3
ALT THE TRY			43	0		10					33						
	148													4			

TODAY'S MEASURED DANGER

FIRE DANGER STATION		-		A.M.		1	(STANDAR		+ +		11 11			8		5	31	HUMIDITY		R TOT (STD.	(M11		Es)	
	ZONE	REC	SPEED	FUEL	VALUE	EC.	SPEED	FUEL MOISTURE	VALUE	0	ED	STURE	VAL UE	HIGHE ST STATION	AVERAGE ZONE BI		(5	TAND	ME)	IN 24HR 30 PM ((51	TIME)		ENDING
		ā	SPE	FUEL	8	OIR	SPR	F.S	18	DIREC	SPEED	MOI	8	HIG	AVE	ZONE	8	12	4:30	RA 1	8	12	4:30	2
ROUT R.S.	В		0	11	1A	W	6	8	6	W	6	6	13	13	13	4	83	46	37		5	7	8	HOUR (S
SAMPSON G.S.	С	SW	2	14	18	SE	3	9	ÎA	NE	4	7	9	9			78	35	34					LIGHTN IN 24 1 4:30 PM
QUARE TOP L.O.	C	E	16	8	34	W	5	7	9	NW	10	6	28	34			34	45	40		15	10	9	YES
														43	22	5								X
LPINE PK.	D	SW	6	22	1B	NW	8	12	2	NW	12	10	6	6	6	3	98	50	42	.03	0	8	8	NO
ALPINE PK.																								
				-						1							1		1					PER MET IN A JAMES OF COMMUNICATION

Stations Cooperating with the U. S. Weather Bureau

Fire Weather Stations

Certain stations have been selected to make observations essential to fire-weather forecasting by the weather Bureau for the Forest Service and other protection agencies. The Weather Bureau network of fire-weather stations is largely independent of fire danger stations. Fire-weather stations may be changed occasionally by the Weather Bureau. Such changes have no effect upon fire danger station records.

Records at Fire-Weather Stations: All fire-weather stations keep the 10-day Fire-Weather Record (Form 1009-E), and a smaller number in addition submit a daily coded weather report. Complete observation and reporting instructions and forms for these stations are furnished by the Weather Bureau. The daily reports are immediately used in preparing the forecast for the next day; whereas, the Form 1009-E record is essential to research in methods of forecasting. It is extremely important that the 1009-E record be correct and complete. As the Forest Service depends upon the Weather Bureau for fire-weather forecasts, so also does the Weather Bureau depend upon the Forest Service to keep weather records at designated stations.

Instruments: For the most part, fire-weather stations will be located at fire danger stations. Where this is not the case, the Weather Bureau furnishes the necessary instruments. Weather Bureau instruments needing adjustment or repair will be repaired or replaced by the Fire-Weather Unit. Fire-Weather offices and the areas they serve are located as follows:

Seattle - Washington; Pendleton - Ochoco and other northeast Oregon forests; Portland - remainder of Oregon. All instrument shelters, whether Forest Service or Weather Bureau, should be given an annual coat of white paint to assure representative readings from the instruments they contain. All shelters should be placed indoors during seasons when not in use.

Temperature and Rain-Measuring Stations

A few yearlong stations have been selected by the Weather Bureau to make daily measurements of temperature and precipitation. The records are kept on Form 1009, "Monthly Record of Climatological Observations", and sent to the Weather Bureau at Portland for Oregon stations or Seattle for Washington stations. Supplies and instructions are furnished by those offices. These data are published monthly for public use.

Automatic recording rain gauges are operated in cooperation with the Hydrology Section of the Weather Bureau in Seattle. Supplies, maintenance, and instructions for these gauges are supplied by that office. The records are used in rainfall, water supply, and stream flow studies.

FIRE CONTROL HANDBOOK REGION 6



PART II PREPAREDNESS

CHAPTER 6
DETECTION

FIRE CONTROL HANDBOOK

REGION 6

PART II

PREPAREDNESS

CHAPTER 6

DETECTION

DETECTION

Table of Contents

	Page No.
Introduction	11-6-1
Qualifications of a Good Lookout	II-6-1
Learning the Country	II-6-1
A Method of Learning Country	11-6-2
Adjust and Orient the Firefinder	II-6-3
Level Firefinder Level Firefinder Base Check Plumb of Sights Replace Crosshairs Replace, Orient Map Disc (½" scale) Adjust Distance Tape Orient the Firefinder Signalling by Mirror Flash for Orienting Why OO is on South Side of Firefinder Care of Firefinder	II-6-5 II-6-5 II-6-6 II-6-6 II-6-6 II-6-7 II-6-10
Make General Observation and Systematic Check Looks for Smoke	II-6-11
The General Observation The Check Look Record Industrial and False Smoke Legitimate Smokes False Smokes Lightning Storms Recording Strikes Sleeper Fires	II-6-11 II-6-13 II-6-13 II-6-14 II-6-14
Locate and Report Fires Locate Fire by Local Landmarks Determine Azimuth Determine Vertical Angle Determine Distance Locate Fire on Firefinder Map by Legal Sub-division Map Reading (Public Land Surveys) Record Data on Lookout Report (Form 1-R6) - Telephone Report Panoramic Photographs Supplemental Detection Points	II-6-16 II-6-18 II-6-18 II-6-19 II-6-19 II-6-23 II-6-24

Table of Contents - (Cont.)

	Page No.
Powder Bomb Signals	II-6-27
Record Status of Going Fires	II-6-27 II-6-27 II-6-28 II-6-28
Safety Rules During Lightning Storms	II-6-30

DETECTION

Introduction

Detection is the act of discovering and locating fires. A forest detection system usually consists of several lookout stations or topographic vantage points which have been carefully and systematically selected because of their collective value for the greatest seen area coverage consistent with the hazards, risks, and values involved.

The main objective of fire suppression is to senfire all fires to the smallest possible area. Discovery and correct location are the essential beginning of suppression work on every fire. This important function is entrusted to the lookout. He is "the eye of the entire fire fighting organization" which he serves. This responsibility entails alert and systematic observation of all his territory throughout the daylight hours and night observation during lightning storms, in order to quickly detect fires which have started. When a fire is discovered, the lookout is expected to accurately determine its location, record required data on Lookout Report Form 1-R6, and forward this information quickly by telephone to the dispatching headquarters. The lookout's job is a challenge to the ingenuity and resourcefulness of the most proficient individual.

Qualifications of a Good Lookout

Good eyesight is the first requisite of a lookout. He should possess vision free from abnormal color deficiencies to enable him to distinguish thin, blue smoke rising against blue-green background and have at least normal depth of vision to enable him to see small smokes at long distances.

He should have rugged physical health in order to endure long, arduous exertion at high altitudes and be able to travel fast and safely in mountainous country. He must be capable of preparing his food, and readily adjusting himself to long periods of isolation. He should possess a thorough knowledge of, or an aptitude for learning quickly with a minimum of supervision, the territory visible from his station and be able to skillfully use equipment, such as maps, firefinder, compass, and hand tools, peculiar to his job.

He should be alert, dependable, self-reliant, and possess the faculty for cool, clear thinking under stress. He must be capable of quickly making clear, accurate observations, calculations, and reports.

Learning the Country

One of the first things the lookout should do is to learn the correct names and location of all topographic features and landmarks that are visible from his station. This means all streams, ridges, buttes, lakes, meadows, roads, trails, old burns, clearings, or any other landmarks which may be of

assistance later in determining the location of fires. Each should be definitely located on the map. If important landmarks are not shown on the map, obtain their correct location and plat them for future use. A lookout's territory may be learned by the following methods:

- (1) Study the country and map together using the firefinder to correlate between the two.
- (2) Secure information from the ranger or any other reliable person who knows the area.
- (3) Study panoramic photographs and identify the topographic features named thereon; check by phone with the district ranger or dispatcher for those not named.
- (4) Utilize every opportunity to travel the territory and learn its features.

The basic knowledge of his territory should be acquired as quickly as possible so that he will be able to confidently give an accurate location on the first fire that occurs within his area. Time is not available after the fire occurs to puzzle out the location.

A Method of Learning Country

The following is a suggested method for systematically learning the country seen from a lookout station:

- 1. Pick out the outstanding landmarks in the area, such as the most prominent mountains or peaks, major streams, highways, and roads. Learn their names and their location on the map, correlating with the firefinder where necessary. In complicated terrain, this can be done by taking the nearest of these features first and gradually working out. These will then serve as known landmarks from which to tie in the less prominent points. To identify a landmark by use of the firefinder, set sights on the landmark and study the actual topography along the line of sight. The tape cuts the same objects on the map as appear along the line of sight. Working from known points, the relationship of the landmark in question can be determined as well as its location on the map, even if the name is not given.
- 2. Working systematically through a stream drainage, a main ridge, or sector, pick out, identify, and locate the secondary streams, peaks and roads, using the firefinder and prominent landmarks previously learned as aids to determine the location of each on the map. Every means available, such as use of field glasses, observing car dusts along roads, and evening shadows in depressions, should be used to learn the topography and landmarks.
- 3. Keep repeating the procedure, adding refinements and detail to the knowledge of the territory. The point is never reached where additional knowledge cannot be acquired, but by diligent and continued application comparatively complete knowledge can be had.

Adjust and Orient the Firefinder

In determining the location of fires, the lookout's firefinder corresponds to the engineer's transit. It is his principal piece of equipment. The accuracy of the readings he is able to secure with it depends largely on the degree of accuracy with which it is set up and kept in adjustment.

The large Osborne firefinder, which is now standard, is comparable in accuracy to a transit for measuring both horizontal and vertical angles. All bearing surfaces are precisely machined. The azimuth circle is engraved by the same method used for graduating transits, but the 24" diameter, which is four or five times that of the average transit, results in an open graduation which can be read accurately by eye to within one or two minutes. The tangent scale used for measuring vertical angles is based on a radius of 22 inches or eleven times the radius of the vertical arc on most transits and is capable of similar accuracy. The two sets of tracks are built to an accuracy of less than 2 minutes.

It is very important to keep the firefinder accurately oriented and adjusted at all times, as a relatively small error in reading may result in a long and costly delay in finding difficult fires. For example, an error of 1° in readings from two lookouts on a fire ten miles away would give an error in location of one-fourth mile on a 90° intersection and an error of $1\frac{1}{4}$ miles on a 15° intersection. An error of only one-fourth mile means that one would have to search over 160 acres, and since one may easily pass within 300 or 400 feet of a difficult fire without seeing it, such an error may result in several hours' delay in finding it. This might easily mean the difference between a small fire and a large, costly one.

The firefinder stand corresponds to the engineer's tripod with this difference: The firefinder stand is the permanent location and should be of very rigid construction. Since the slightest turn, twist, or rocking will throw the instrument out of adjustment, care should be exercised to protect the stand from any unnecessary strain or jar. The firefinder should be carefully checked for adjustment at least once daily. It should not be used as a place to lay books, clothes or other articles, but should be treated as a finely adjusted instrument to be kept in constant readiness for instant use.

The four consecutive steps to be followed in orienting a firefinder are:

- (1) Level the firefinder.
- (2) Plumb the front and rear sights.
- (3) Orient the map to the firefinder.
- (4) Orient the firefinder to true north.

Level Firefinder

To level a firefinder, the base of which is approximately level and firmly fastened to a rigid stand, proceed as follows:

- 1. Loosen all lock nuts on leveling screws and run them well up.
- 2. Adjust all four leveling screws so that their lower ends protrude about 1/8".
- 3. Set small spirit level on the graduated rim (this is the extreme outer edge of the top plate situated outside the sight ring) parallel to diagonally opposite leveling screws. (See Fig. 1.) Turn both these diagonally opposite screws at the same time, one up and one down (accomplished by moving both thumbs in same direction—to inside or outside) until bubble rests in center. Then shift spirit level to a like position parallel to the other two diagonally opposite screws and level. Move back to first position and correct for any disturbance caused by second adjustment. Repeat until instrument is level in both directions and all four screws rest firmly on the track rails. Then tighten lock nuts, being careful not to disturb setting of leveling screws. (Caution: The bottom edge of the rail fitting grooves must never be raised above the center of the rail, as reduced width would result in side play and affect the accuracy of orientation.)

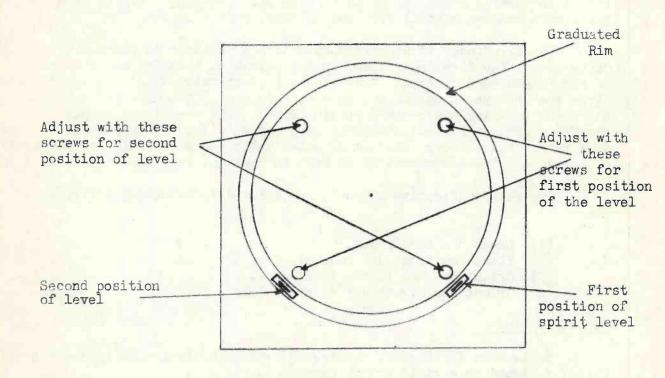


Fig. 1

Level Firefinder Base

After the firefinder has been carefully leveled as described above for one location, its level should be checked for all positions on both tracks. Occasionally the track rails sag or become bent, making it impossible to adjust the instrument to give the same reading in all positions. If the firefinder is found to be out of level for positions other than the original, the straightness of each track rail should be checked. This can be done by making a bow from any suitable springy wood, using a fish line or good grade string for bow string in such manner that string will pass over end of wood (see Fig. 2). The string is a true straight edge which can be used to check the straightness of each track in both horizontal planes. Bow should be just slightly shorter than track rail.

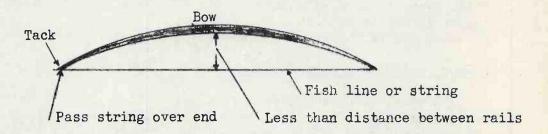


Fig. 2

A sagged track rail can be raised to a straight position by a small wooden wedge placed between the rail and the wooden base.

If all track rails are straight and the firefinder is still found to be in adjustment for one location but out for others, the trouble may be that the firefinder base is not true. In this case the lockout should call the dispatcher or ranger to obtain proper instructions. The correction of this fault by wedging requires extreme care to eliminate danger of twisting the base. The screw holes in the track spacers for fastening the tracks to the wood base are slotted to allow for shrinking and swelling of the wood base.

Check Plumb of Sights

To check plumb of sights proceed as follows:

- 1. Be sure that instrument is level.
- 2. Suspend a weighted thread or fish line from some convenient point near inside wall. It should hang clear of all obstructions and not be swayed by wind if it is to serve as a true plumb line.
- 3. Check plumbness of front sight vertical hair by sighting through bottom of rear sight at plumb line. If vertical hair does not coincide through out its length with the plumb line, it is not plumb. On some instruments this can be corrected by shifting sliding bar at top of sight but for instruments not so equipped, it can best be done by shimming up the low side of the sight standard.

4. With front sight plumbed, rear sight slot can be checked by sighting on small point or dot and raising the eye slowly from bottom to top of slot. If the dot appears to move away from the front hair, the slot is not plumb. It can best be corrected by shimming up low side. To prevent disturbance of the sights, the sight standards should never be used to revolve the sight ring. Always use the lug on the sight ring which is provided for that purpose.

Replace Cross Hairs

Occasionally one of the hairs in the front sight may become broken. Broken hairs should be replaced by securing a black horse hair and adjusting in the grooves to snug tautness. Horse hair is used for the front sight because it can be kept straight, does not fuzz or rust and is plainly visible in taking sights. Thread or wire should be used only in emergency.

Replace, Orient Map Disc (2" scale)

One-half inch scale base maps are usually mounted on firefinder discs. To replace the map disc, take out the screws which hold the map in place and remove the old disc. Place new disc over center pin and replace screws.

To orient firefinder map with the azimuth graduations:

- 1. Revolve sight bearing ring until it reads exactly 0° on the graduated circle.
 - 2. Loosen flat-headed screws around outer edge of map disc.
- 3. Rotate map disc around center pin until red-inked Meridian line of map lies directly under the steel tape which extends across center of instrument, while instrument still reads 0°. Be sure north end of red Meridian line lies adjacent to front sight. Look straight down on tape to check alignment.
- 4. Clamp disc in place by gently tightening the flatheaded screws, being careful that the position of the disc is not disturbed in the process.

Adjust Distance Tape

The distance tape is suspended between the centers of front and rear sights by adjusting screws. The tape should be carefully adjusted by use of the screws at either end so that 0 will be over the exact center of the map disc and center pin. Too much tension on the distance tape will spring the sight bearing ring and cause it to turn hard.

Orient the Firefinder

The object is to set and lock the azimuth circle in such a position that the line of sight will always be true north when the indicator on vernier is set at 0°. With this done the reading on any object gives its angular distance from true north. Each station will usually be furnished the correct

azimuth to at least one orienting point. With the correct azimuth to a defined orienting target (as another lookout house) known (say 127° 25') proceed as follows:

- 1. Revolve sight bearing ring and set vernier carefully on correct azimuth (127° 25'). (See page II-6-17.)
- 2. Leaving the vernier on this setting and without touching the sight bearing ring, loosen the clamp screw between upper and lower plate and revolve the entire top plate of the instrument until the line of sight cuts the designated target.
- 3. Clamp top plate in this position by tightening the clamp screw. Then check both the sight alignment and the azimuth reading; if both are correct, the instrument is accurately oriented. If the stand is rigid and reasonable care is exercised, the instrument should remain in adjustment for days or weeks, but to make sure, the orientation and level adjustment should be checked at least once each day.

Signalling by Mirror Flash for Orienting: The most accurate method of orienting the firefinder is to sight on a mirror flash from another lookout. The mirror must be properly focused or it cannot be seen. Figures 3 and 4 illustrate two simple methods of focusing mirror.

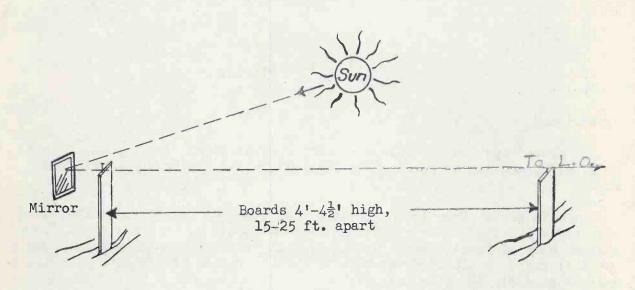


Fig. 3

First line up the nail heads with the lookout to which it is desired to flash, then flash mirror rays across nail heads.

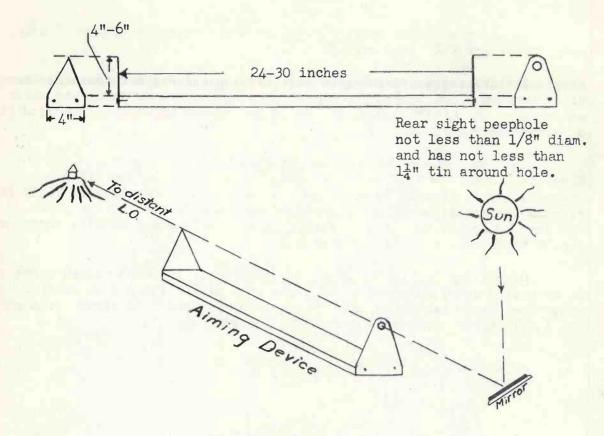


Fig. 4

Directions:

Place sight on convenient support such as stump, rock, chair, guard rail, etc., and aim at point to be flashed same as aiming a gun with peep sight.

Hold mirror from $l\frac{1}{2}$ to 4 feet behind sight so that flash falls on rear sight and light passing through peephole shows as a small round light spot on body of front sight. Gradually tilt mirror so that light spot rises until it rests on tip of front sight. Hold mirror in this position and flash will be directly to point desired.

This device has the advantage that it can be used in crowded quarters, such as on a tower. It is quick and easy to use, and a steady flash can be maintained.

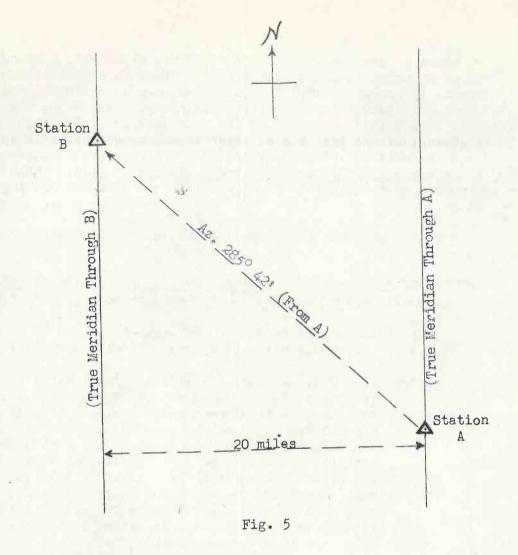
Where accurate orientation data is not available, a convenient method of securing it is to determine the absolute orientation of one instrument by use of a U.S.G.S. azimuth or by observation on the North Star (see any standard work on plane surveying). All other instruments can then be precisely oriented by the usual method of foresighting and backsighting, except that a small correction on account of convergence of Meridians must be added or subtracted. This correction amounts to .9' for every mile of departure between stations; (i.e., the distance measured due east or west from one station to a Meridian passing through the other.)

A convenient rule for computing the corrected backsight is as follows:

If foresight is <u>less than 1800</u>, add to it 1800 + .91 for every mile of east and west departure between stations.

If foresight is more than 180°, subtract from it 180° + .9' for every mile of departure between stations.

Example: (See Fig. 5.) Let A = oriented instrument: B = instrument to be oriented. By measuring on the map due west from the plotted position of A to a point due south of the plotted position of B the distance is found to be 20 miles. The lookout at A foresights on a mirror flashed from B and finds azimuth to be 2850 421. As this is more than 180°, the corrected backsight from B to A = 285° 42' - (180° + .9' x 20) = 285° 42' -(180° \$ 18') = 105° 24'. To orient instrument at B. use 105° 24' as correct azimuth to A and proceed as described above. As an aid to furnishing a rough check on orientation of firefinder at night when regular orientation point cannot be seen, it is good practice to have a well defined plumb line location or other suitable mark inside the lookout house to sight on. This should be located truly parallel to the set of tracks used in making check.



Why 0° is on South Side of Firefinder

Azimuth readings on firefinders start at 0° or north and progress clockwise through the east, south, west and back to north. When sighting due north with a firefinder, one stands at the south side of the instrument to look through the rear sight. For convenience in reading, the graduated circle has been rotated 180° placing 0° on the south side so that readings can be made direct without the necessity of walking around the firefinder to read them.

Care of the Firefinder

In addition to always keeping the firefinder level and in angular adjustment, it should be kept clean, especially the graduated circle and the vernier so that angles can be read quickly and accurately. A thin film of oil should be kept on the track and under the sight bearing ring to prevent wear and rust as well as to facilitate easy operation. Use only a <u>light</u> oil. If working parts become sticky or rusty, clean with kerosene, dry, and re-apply oil.

The map should be kept clean and in good condition. If a new map is needed, it should be called to the attention of the ranger.

If the fire finder is in the open, it should be kept covered when not in use. In absence of regular cover, a heavy canvas will serve.

Make General Observation and Systematic Check Looks for Smoke

During possibly dangerous fire weather the lookout should have all his seen area under observation throughout the daylight hours. The entire fire fighting organization is depending on him to see and report all fires occurring within his area at the earliest time they can be detected. This means when they are small and before they have the opportunity to gain headway. Small fires, and those cut off by intervening topography, frequently can be detected only by an occasional puff of smoke which rises above timber or ridge top at infrequent intervals. In order to detect these fires promptly, alert and systematic observation is necessary. Experience has shown that best results can be had from a combination of general observation interspersed with short periods of intensive check looks.

On clear days observations, especially looking into the sun, require

On clear days observations, especially looking into the sun, require excessive exposure of the eyes to bright light which may result in permanent injury to the eyesight unless protection is given. It is vitally important that the segment of the seen area toward the sun is not neglected because of the discomfort of looking. To protect the eyes against both injury and discomfort, colored glasses are furnished and should be worn at all times when they are needed.

On points with towers for observation but with living quarters on the ground, lookouts will follow the policy of taking a noon lunch to the tower so that continuous detection will be given during this dangerous period. On all stations provision for getting wood, water, or for any other work which requires a break in detection coverage will be governed by a schedule designed to synchronize all stations so that no two lookouts who see the same territory will be gone at the same time. No detection man should be off either his observation point or his telephone for even short periods without first clearing with the district dispatcher.

The General Observation

General observations should be made without strain, but at the same time the lookout should be sufficiently alert to detect the first signs of a fire. Normally it is a continuous systematic slow-scanning of the entire seen area, but with a greater portion of the time spent on high-risk areas, such as logging operations, camping areas, fishing streams, or well-traveled roads, where man-caused fires are most apt to start. The eyes do not actually focus on any particular point in this type of observation unless attracted by the presence of something unusual. Following lightning storms, areas covered by them would be added to other high-risk areas.

The Check Look

The check look is an intensive part-by-part examination of the entire seen area. Each detail of the terrain is closely scrutinized to make sure that

*no fire exists. The eyes are definitely focused in a searching survey requiring full concentration on the part of the observer. Depending on the size and character of the seen area involved, the usual check look can be effectively made in five minutes.

Check looks should be made from all stations within the first half-hour after sunrise and shortly before dusk to give maximum insurance against fires reaching dangerous proportions during the night. Check looks should be made throughout the remainder of the day as warranted by the fire danger and risk.*

This is would pay to furnish clocks that would sound a bazzer every 15

It is essential to use a systematic method of making check looks to check looks insure that all areas are examined. This may be done by breaking the seen area into natural topographic units such as stream drainages, ridges, or other units, and examining each of these units individually. Each such unit should have readily recognized topographic boundaries to insure against "skips" or "blanks". Ordinarily, check looks should begin with the same unit, say number 1, and progress consecutively in a clockwise direction until all units have been examined. These units should be small enough to allow easy examination without too much shifting of the eye. If a natural unit, such as a broad stream drainage, is too large to examine readily, it should be divided. In making the examination of each unit, the usual procedure is to examine the nearest territory first and progress outwards by natural subunits.

Division of the seen area for making check looks can be done by forming 45° or small sectors with the fire finder. This method may prove best for some types of country.

The importance of check looks is illustrated by the fact that after a fire has been discovered in a certain locality and other lookouts notified of its existence, they are usually able to see promptly, by close scrutiny, smoke which otherwise might not have been discerned by general observation.

It is well known that under some conditions small fires can be seen at greater distances than others. Smoke haze in the air is probably the most common cause of reduced visibility. In periods of extreme low visibility night observations may be used to make sure fires are not burning unobserved. A fire of any size may be detected by its glow caused from the reflection of the flame on the smoke column. Careful study is required for accuracy.

Fires are most apt to become established during the heat of the day or within periods when fires will burn readily. This is also the period of most rapid spread and requires accurate and energetic work on the part of the look-out to permit aggressive initial action to be taken. Fires sighted in the early morning, in the evening, or at night allow more effective work hours before the heat of the day when fires are most difficult to control. Good field glasses often prove invaluable in assisting the observer to identify difficult smokes when they are small.

Record Industrial and False Smokes

Since the interest is only in illegitimate fires which destroy or threaten to destroy resources the lookout is charged with the responsibility of distinguishing between these and all others. Frequently this is a difficult task, requiring accurate observation and appraisal to reach a definite decision. Safe decisions will be the policy, and for this reason it is inevitable that occasionally "false alarms" will be reported. Of this group the campfire is probably the most difficult to determine. All smokes should be reported that cannot be definitely identified as false or legitimate. Although experience is the real key to making accurate determinations in case of close decisions, there are several general guides which will assist the lookout in attaining this experience. He should use every aid available to become proficient quickly.

Legitimate Smokes: These include all smokes from sources such as locomotives, sawmills, ranches, campfires, debris burning, industrial operations, which are authorized by law or permit and are under control. All such smokes which have a fixed location should be carefully plotted on a They should also be recorded on the "Legitimate and False Smoke" form giving azimuth, vertical angle, location, and description and this record posted conveniently for ready use in checking locations on days of poor visibility. Inasmuch as such smokes are likely to change from year to year, these records should be brought up to date promptly at the beginning of each season and currently thereafter. The fixed smokes usually have definite characteristics with which the lookout should become thoroughly familiar so that he can readily recognize them under all conditions. The azimuth and location should always be checked with firefinder whenever a question arises concerning a known legitimate smoke. Legitimate smokes that are not fixed. such as campfires, tend to occur in localities and at more or less definite hours of the day. The localities should be learned.

False Smokes: A false smoke is any phenomenon which is not actually smoke but appears as such under certain light or weather conditions and is likely to be reported as a fire. Anything which is commonly mistaken for fire and which has a permanent location (such as rock slides, openings, small deadenings, and some dusts) should be pletted on the same map used for legitimate smokes, and in addition should be carefully recorded by azimuth, vertical angle, location, and description on the "Legitimate and False Smoke Record" form, which should be posted conveniently for permanent and ready use. A rock slide or an opening may be easily identified as such on a clear day, but when outlines are blurred by thick haze, identification may be extremely difficult. The new lookout should study carefully the false smokes recorded for his station and become thoroughly familiar with each one. Check the location by horizontal and vertical angle when in doubt.

False smokes which have a fixed location are the easiest to distinguish because they have no movement or smoke column. Careful and accurate observation will usually reveal this even to the new man. The more difficult of the dusts and fog puffs present a more complicated problem. They are not usually fixed, allowing predetermination of location, and there is movement

similar to that observed in smoke. In spite of this similarity, there are sufficient distinguishing characteristics which can be detected by the experienced observer. All of these characteristics cannot be clearly defined, but general hints as to what to look for can be given: Dusts characteristically have a yellowish color while smoke characteristically has a bluish color. Dusts usually have horizontal movement of the base. The tendency of dust to settle out of the air usually causes it to thin out on the upper and outer edges, while smoke tends to hold together and continue to climb; a smoke just observed will be similar in its vertical pattern to existing known smokes. Usually dusts attain considerable size almost instantaneously, much faster than the normal fire, and those like sheep dusts have a wide base out of all proportion to their height when they first show. Trouble with sheep dusts and those along roads can be eliminated largely by keeping currently informed on the movements of bands of sheep and knowing the location of roads.

Fog puffs, which frequently occur in timbered country following lightning storms, are sometimes mistaken for fire. They are characteristically
white and, unlike smoke, have no bluish shades intermixed. They have a strong
tendency to thin out on the edges, and if watched while stringing out of some
pocket, frequently tend to "pull thin" and have more the appearance of
"floating."

Lightning Storms

Every lightning bolt which strikes the ground is a potential fire. For this reason lightning storms are the most important weather phenomenon which the lookout observes. The approach of lightning storms should be observed and reported to the dispatcher or district headquarters so that preparation can be made for manning emergency points, assembling men, or having organized crews stand by.

Recording Strikes: Every lightning strike which goes to ground within the seen area day or night should be observed and recorded by time, azimuth, location, and vertical angle, if possible. If time permits, these should be shown on the firefinder map with a red cross. A "Cellophane" pencil is ideal for writing on map disc.

Frequently strikes occur in such rapid succession that time is not available to secure and record complete information on each. In such cases an attempt should be made to observe all strikes and record as much information as possible. When strikes are occurring at the rate of several per minute, a systematic method must be used to secure even the minimum information. One good method is to place a paper disc, extending under the map to the inside edge of the sight ring. As a strike occurs, the sight ring can be quickly spun to position and mark placed directly under the tape near the rear sight. If time permits, a numeral can be placed near the line to represent distance. The azimuth can be taken later, and as much other information as the observer can recall. The marks can be erased for those strikes that develop into fires and for which complete reports have been made. The marks remaining will serve as ready reminders of strikes which should be carefully scrutinized for at least five days after the forest litter has dried out. This method could be used to segregate and record strikes from more than one storm by using different colored pencils. The distance from the lookout station to the point

of strike can be calculated roughly by counting the number of seconds between the flash and the report of thunder following. The distance equals approximately 1100 feet for each second elapsing, or one mile for each five seconds.

Sleeper Fires: Lightning fires frequently smoulder for days or even weeks before they send up enough smoke to be seen. These have been termed "sleeper" fires and are particularly dangerous because of their likelihood of spreading rapidly as a result of the forest litter drying out. They often show up during the worst burning conditions. For this reason it is extremely important to extinguish as many fires as possible while favorable conditions prevail. The best time for effective observation is usually early in the morning following the storm. The lookout should take full advantage of this period and should watch carefully for several days the locations of all observed strikes as well as the entire area over which the storm passed. Frequently a direct lightning hit results in a puff of smoke, dust or steam. This does not necessarily mean that a fire has been established, but if it continues to show for more than two minutes, it should be assumed to be a fire and reported as such.

Locate and Report Fires

When the lookout sees what appears to be a smoke, he first decides whether it is a false or real smoke. Having concluded that it is a real smoke, he next decides whether it is caused by a legitimate or an illegitimate fire. When a decision is made that the fire should be reported, the time this decision is reached will be entered as the "time sighted" and the remainder of the information called for on the "Lookout Report" form will be obtained, recorded on Form 1-R6 (See Fig. 6), and reported to district headquarters. A detailed explanation of each item called for on the form is made on the following pages.

LOOKOUT REPORT

Name of	fire He	MITOCK 1	Read items (1) to (11) to dispatcher. Do not repeat printing to left.
Station r	eporting	(1)	Seemore L.O.
Location	by landm	arks (2)	3/8 mile north of e of slope on south
			tte, 400 ft. below a rock slide in heavy
timber			

***********		******	

Azimuth			268° 14'
Verticle	angle	(4)	_ 30 301
Distance		(5)	8-3/4 Miles
Twp., Ra	nge, Sect	ion . (6)	
Subdivisi	on	(7)	NW ¹ / ₄ SE ¹ / ₄
Smoke dr	ifting fro	om . (8)	Southwest
Volume, c	olor,char	acter (9)	Small, blue, thin column
Base sigh	ted,Yes o	r No (10)	Yes
Size, acre	s or fract	cions (11)	1/8 acre
	DATE	TIME	
Originated.	7/22	4:00 pm	from Lightning
Sighted	7/23	9:03 am	(cause) by John Doe
Reported	11	9:06am	to Catlow at Dispatch RS

Tangent offset $1' = 1\frac{1}{2}$ ft. per mile. Keep diary of subsequent action on reverse.

u. 8. department of agriculture forest service

(OVER)

Fig. 6

Locate Fire by Local Landmarks

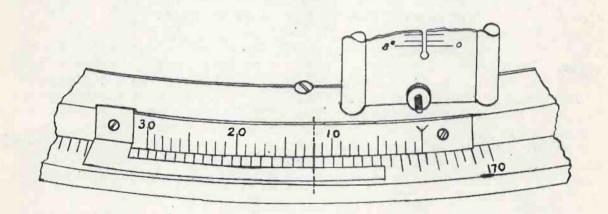
Upon first sighting what is believed to be a fire, the lookout should proceed immediately to locate it with reference to local landmarks (the word "local" here means landmarks local to the fire in question) and record this location with the time sighted on Form 1-R6. Local landmarks which will be of the greatest assistance to the smokechaser in finding the fire and to the dispatcher in readily visualizing its location should be selected. The most

useful local landmarks are creek forks, ridge tops, rock slides, open places, clumps of timber and similar natural characters not shown on the map. Cardinal directions should be used instead of right or left. Reference to road or trail should not be made unless it can be seen by the lookout. The description should be kept clear and concise.

Intimate knowledge of the country is invaluable to the lookout in readily selecting the local landmarks to use, speeding up this part of his report, and locating the fire on the map. Location by landmarks is given first in the report to permit the dispatcher to visualize at once the general location of the fire.

Determine Azimuth

The azimuth, or horizontal angle from true north to the fire, is determined as follows: With the firefinder in proper adjustment revolve the sight ring until, by looking through the rear sight slot, the vertical hair of the front sight cuts the center of fire base. Where fire base is not seen and smoke is drifting, sight on the edge of the smoke column from which the drift is coming. Read the azimuth by use of the vernier located directly below the rear sight, and record at once on Form 1-R6. (See Fig. 7.)



30-minute Vernier used on Instruments Graduated to 1/2 degree

Fig. 7

Rule: Use arrow or zero line on vernier as indicator and read the value of the last division to the right on the azimuth circle (Fig. 7, 173° 30').

Note the mark on vernier scale which matches a graduation mark on azimuth circle and read value from zero point on vernier to left. Each mark on vernier equals 1! (Fig. 7, 12!). Add minutes read from vernier to azimuth circle reading (Fig. 7, 173° 30! + 12! = 173° 42!). On most firefinders there is a shield which covers up the numbers on the azimuth circle immediately to the left of the zero point of the vernier to prevent misreading.

Azimuth angles should always be read accurately to the nearest minute. They will be used for plotting and for computing tangent offsets. Accuracy is important.

Hint: For difficult night shots it may be necessary to illuminate the cross hairs, without blinding the observer with direct light to the eyes. This can be done by fitting a slotted cardboard hood over a flash-light lens in such a manner that only sufficient light is directed on the cross hairs to permit their being seen. Likewise, it may be found advantageous to illuminate only part of the cross hair and project this through the fire. Other good methods may be used.

Determine Vertical Angle

The verticle angle should be measured for all fires. It is essential in all cases where graduated panoramic pictures are used. In other cases, where good topographic maps are available, an accurate location on most fires can be secured from one lookout station only by plotting the intersection of this angle with a profile of the topography lying along the line of sight. In still other cases the vertical angle can be used in computing the relative elevation of a fire in reference to ridge tops or draws.

Most firefinder sights are specially equipped for measuring the vertical angle. The instrument must be in proper adjustment to give accurate readings. Use of the Osborne No. 4 is described in the following. (Other types will be explained by the ranger.) The front sight is equipped with two horizontal cross hairs; the upper one for measuring plus (+) angles or those of elevations above that of the station, and the lower one for measuring minus (-) angles or those of elevations below that of the station. As most fires will be below the elevation of the station, usually the lower hair will be used. The rear sight is equipped with a sliding peep sight operating on a vertical scale.

The rear peep sight should be so adjusted that when sighting through the hole the proper front cross hair accurately cuts through the center of fire base. The vertical scale setting of rear peep sight should be read to the smallest angle possible and the reading recorded at once on Form 1-R6.

Generally speaking, the greater the vertical angle, the greater the accuracy that can be expected in its use, either for spotting fire on panoramic photographs or on topographic maps. Usually the nearer the fire is to the lookout, the greater is the vertical angle. Vertical angles offer a means of checking fire locations both to the lookout and the dispatcher.

Determine Distance

Using the local landmarks and the line of sight, the fire should be

spotted at the proper location on the firefinder map. The distance is read on the tape in inches and fractions from the center pin to the spotted location. The tape is graduated in inches, and distance should be accurately scaled to the smallest division practicable. This should be converted to miles which can be conveniently done for $1/2^n$ scale map by multiplying the distance in inches and fractions by two. Example: Scaled distance = 2-1/16 inches; $2-1/16 \times 2 = 4-1/8$ miles. Distance in miles should be recorded at once on Form 1-R6.

Locate Fire on Firefinder Map by Legal Sub-division

The location of the fire as spotted on the map must be correctly located by legal subdivision; i.e., by township, range, section, and subdivision of the section. This is a specific location that can be readily spotted on any map of the area and serves as a refined check on the general location by local landmarks. It is important that the lookout be skilled in reading his map so that he can be both accurate and fast in making this determination. Proficiency can be attained by practice. Location of fire by legal subdivision should be recorded on Form 1-R6 at once.

Map Reading (Public Land Surveys)

A map is a more or less accurate graphic representation of the actual topographic area which it covers. The lands in the western states have been subdivided in the public land surveys following a very definite pattern. First an initial starting point was selected which for the states of Oregon and Washington is located a short distance west of the city of Portland. A true north and south line was surveyed through this point, which became the principal Meridian to which all other north and south lines are referred. This is known as the Willamette Meridian. At approximately six-mile intervals on either side, secondary north and south lines were surveyed parallel to the principal Meridian known as Range lines. The six-mile wide areas between Range lines are known as ranges and are designated 1, 2, 3, etc., east or west (of the principal Meridian).

A true east and west line was surveyed through the initial point which became the principal base line to which all other east and west lines are referred. This is known as the Willamette Base Line. At approximately sixmile intervals on either side, secondary east and west lines were surveyed parallel to the principal base, known as Township lines. The sixmile wide areas between these lines are known as townships and are designated 1, 2, 3, etc., north or south (of base line). The township and range lines divide the area into squares approximately six miles on a side. (See Fig. 8.) The area within each of these six-mile squares is also known as a township. Township and range lines on the usual map are comparatively heavy and easy to identify.

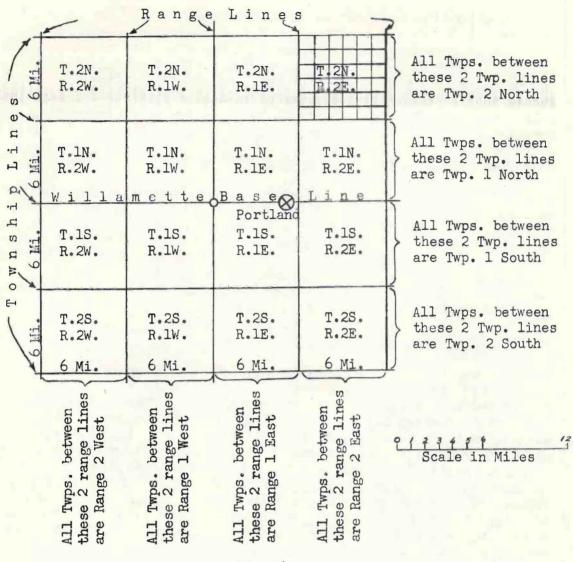


Fig. 8

A full township is subdivided into 36 sections, each of which is approximately one mile on a side, and the method of numbering is shown in Fig. 9. Section numbers do not appear on the usual forest map, but section lines appear in one of two ways (See Fig. 9): (1) In country which has been surveyed as a thin solid line, and (2) in country which has not been surveyed as a thin broken line. A broken line is also used to distinguish between surveyed and unsurveyed township and range lines. In addition to the above there are lines of latitude and lines of longitude which appear on the usual forest base map. They are continuous thin solid lines running entirely across the map east and west and north and south, respectively. Latitude lines designate the degrees and minutes north of the Equator. Longitude lines designate the position west of Greenwich, England. They are very similar in size to the section lines and often extreme care is necessary to distinguish them from section

lines (See Fig. 9). They can be distinguished best by observing whether or not they continue as straight lines completely across the map, coupled with the fact that sections are usually square, which fact usually identifies the section line.

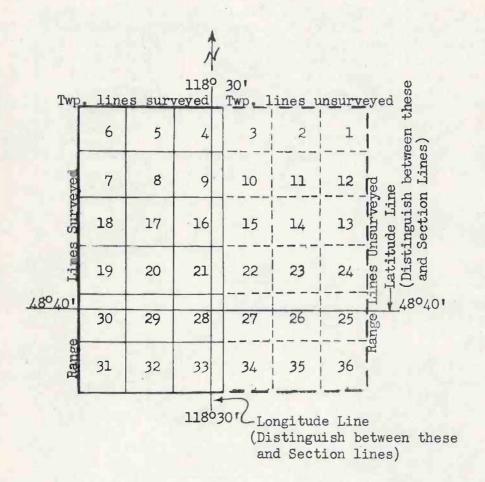


Fig. 9

Fractional Townships, or those having less than 36 square miles of area as described above, frequently occur. These may be due to error in early-day surveys, to large bodies of water, to joining of two surveys for which separate sets of base lines and Meridian lines were used, or other causes. They may be from one to five sections wide either north and south or east and west. The numbering of the sections in such townships is governed by the control lines for the survey; for instance, if the east and south lines were the control, their numbering would start with Section 36 in the southeast corner and proceed north and west using the usual numbers and placing the discrepancies in the north and west tiers of sections. However, numbering of sections might start in any corner of the township so there is no fixed rule for determining the correct numbering other than to check the official General Land Office township plats. To avoid errors in reading, all fractional townships should be correctly numbered on the firefinder map.

Due to correction made for convergence of Meridian lines or on account of errors in surveying, some townships have more than 36 square miles of area. This may result in one or two of the outside tiers of sections being greater than one mile in length. These usually occur in the north and west tiers of sections.

Each section is subdivided as illustrated in Fig. 10. Each 40-acre tract may be accurately described with reference to the General Land Office survey by giving the township, range, section, subdivision of the section and control Meridian. For convenience standard abbreviations are used as follows: Township = T; Range = R; Section = Sec. (or S); North = N; East = F; South = S; West = W; Willamette Meridian = W.M.; and Quarter = $\frac{1}{4}$. Subdivisions of a section are described according to their position in the section with reference to the cardinal directions; i.e., NE_4^1 is the 160 acres occupying the northeast quarter of the section. Likewise, NE_4^1 SW $_4^1$ is that specific 40-acre tract occupying the northeast quarter of the southwest quarter of the section, etc. (See Fig. 10.)

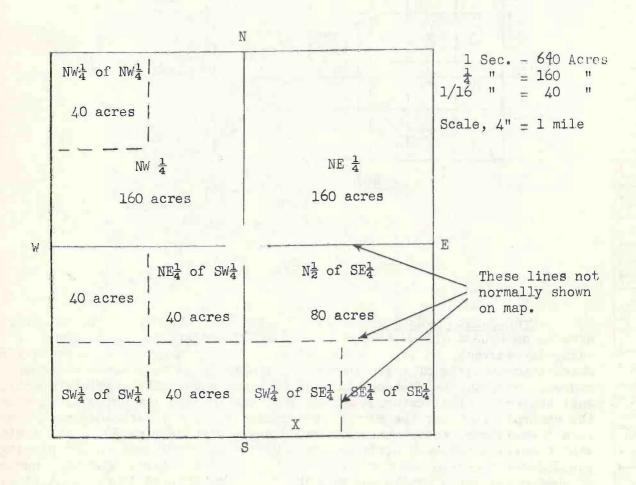


Fig. 10

Hints: (1) Township and range lines on firefinder maps are sometimes run in with a different color ink or made heavier so they can be readily distinguished from other lines on the map. This procedure may serve as an aid to the lookout and prevent errors in reading the wrong township, range or section; (2) As a further aid to the lookout in reading the proper section and subdivision of the section, an overlay township on the same scale as the firefinder map may be laid out on a piece of celluloid in which the correct section numbering of a standard township is shown with one section properly subdivided into forties.

Record Data on Lookout Report (Form 1-R6) - Telephone Report

A supply of forms should be kept handy at all times with Item 1, or name of station reporting, filled in well in advance of anticipated need. Time sighted should be entered when the lookout begins to fill out report. Items 2 to 7 inclusive, or location by local landmarks, azimuth, vertical angle, distance, township, range, section and subdivision of the section, respectively, should be determined in the order given and entered on the form concurrently as the data becomes known.

For item 8 the direction, such as southwest or west, from which smoke is drifting should be observed and recorded. "None" should be entered if smoke is coming straight up. This is important as it often aids in finding the fire and in measuring the hazard by defining the direction of probable spread.

In item 9 the most understandable general terms should be used to describe the smoke as: For volume, small, medium or large; for color, blue, whitish, yellowish, coppery or black; and for character, threadlike, thin, heavy, or billowy column, drift smoke, or blanket smoke. Enter data on Form 1-R6 at once. This description is an indication not only of size and intensity of the fire, but also of the material in which it is burning. It is basic data in determining the number of men and type of equipment needed. It tells the smokechaser what he must look for and indicates the difficulty which may be encountered in finding the fire.

In item 10 it is always important to state whether or not the base is actually seen directly by the lookout reporting. (The base of the fire is considered to be seen if the smoke can be seen issuing directly out of the tree tops.) It shows instantly how much reliance can be placed on the azimuth reading or plotted location and may be of great assistance to the smokechaser. If the base was sighted, he knows the azimuth is reliable and that the lookout station must be visible from the vicinity of the fire. Enter on form at once.

In item 11, it is very important that the best possible estimate of the size of the fire be made by the lookout, for he is the only one who has seen it. His estimate is better than a guess by anyone who hasn't seen it. Campfires and single snags should be recorded as such. On all other fires which can be seen directly, make the best determination possible of their size in acres or fractions of acres. The lookout should use every method available to him in developing his efficiency in estimating size of fires. Size as estimated should be entered at once on Form 1-R6.

As soon as all the data have been entered on the lookout report form, each item should be quickly checked for errors and the exact data telephoned to the dispatcher. If the dispatcher cannot be reached, the report should be given to the smokechaser or somebody on the forest who can take action, later checking with the dispatcher. To avoid delays in taking reports, a supply of lookout report forms with a pencil should be kept at each telephone on the forest.

Unless otherwise directed, Forms 1-R6 should be completely made out for all fires except legitimate smokes and reports forwarded quickly to the dispatcher. To reduce time, only the data filled in for Items 1 to 11, inclusive, should be read to the dispatcher. The printed material should not be read. The dispatcher will furnish the report time, the fire number, and later the name of the fire to the lookout. This will insure that all records for the same fire will be kept under the same name and number.

The lookout should train himself to prepare and telephone to the dispatcher reports on fires accurately and quickly. After sighting a fire he should be able to make an accurate report, check it, and forward it to the dispatcher in from 2 to 5 minutes. The good man will do it in from 2 to 3 minutes and the average should do it in not more than 5 minutes. The dispatcher or ranger will check the ability of the lookout to meet these standards and practice will be required until they are met.

Panoramic Photographs

The panoramic photograph is a valuable aid in locating and describing the location of fires. Each photograph carries a horizontal reference line corresponding to the elevation of the lookout station from which it was taken. It shows on the upper margin the azimuth angles corresponding to the azimuth circle on the firefinder at that station. A vertical angle scale is provided for defining the line of sight and reading the vertical angle in reference to the horizontal line. The entire seen area of each station is covered by from 1 to 3 photographs. Each photograph should be neatly and accurately labeled with the names of all the principal topographic features, such as streams, drainages, peaks and ridges (See Fig. 12).

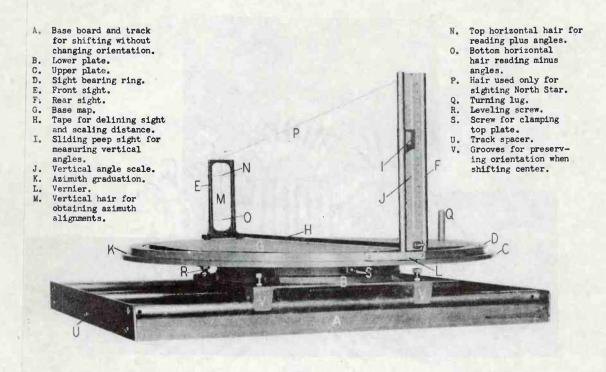


Fig. 11

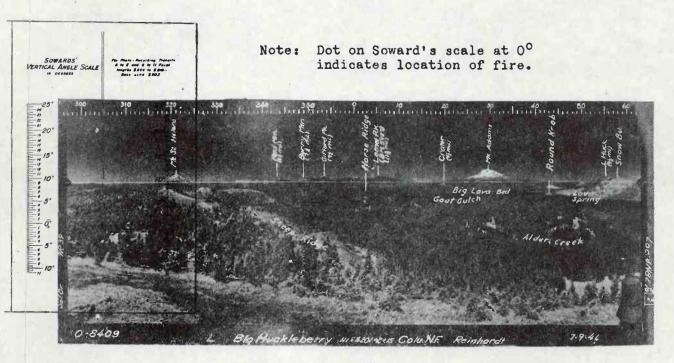


Fig. 12

II-6-25

R-6 F.C. Hdbk. *Amended 6-24-52 No. 70

The panoramic photographs are of the greatest value to the lookout when making night shots or on days of restricted visibility when the actual topography is badly blurred. With the photographs, which usually reflect clear conditions, he is able to secure more accurate locations and give clear descriptions. Under any condition the dispatcher and smokechaser are greatly aided in understanding the lookout's description and in better visualizing the actual conditions in the fire area.

The procedure for use of the photographs is as follows:

- *-1. The vertical-angle reading is placed on the level or zero line shown on the picture. The scale is then shifted along the zero line until the center perpendicular line on the scale corresponds with the given azimuth reading. When these two procedures are completed, the red dot will be the location of the fire. The perpendicular lines on each side of the center line are 15' apart so that the azimuth can be scaled accurately to the nearest 30'.
- 2. Use small magnifying glass to bring out local details. (Tests indicate that with a good picture and a magnifying glass, one can normally see details nearly as well as the lookout can see them under clear conditions without glasses.)-*

Supplemental Detection Points

Many of our lookout stations require the use of supplemental points to give detection coverage to areas which cannot be seen from the principal detection point. Frequent coverage of such areas is essential. Definite look schedules should be prepared and conscientiously followed which will provide the best coverage possible consistent with the hazards and risks involved. Seen area maps and panoramic photographs should be prepared for any such points of reasonable importance. Usually, azimuths to fires from these points will be taken with a compass. Care should be exercised to secure as accurate readings as possible consistent with desirable speed. Otherwise, making the report and reporting will be the same as for the regular point.

The foregoing applies principally to points comparatively near to a developed lookout station. In exceptional cases, where lightning is the chief cause of fires in a series of small areas in the back country for which satisfactory detection coverage from any one point is prevented by the character of the topography, the use of a series of points may be indicated. In such a case, it might be essential to keep someone in the area because of inaccessibility, but the principal need for detection would be during and following lightning storms. Headquarters could be placed at the most convenient location and valuable work done between periods of needed detection. During and following lightning storms the lookout could cover

the various detection points giving emphasis to those covering the areas most seriously affected by the storm. He would report by radio or from the nearest telephone, depending on circumstances.

Azimuth to fires could be determined with a compass either from a location plotted on the map or by first securing azimuths to two known points (2-point intersection) and all three azimuth angles furnished the dispatcher for accurate determination of the observer's position and that of the fire at time of sighting. This procedure might give the most practical coverage under some conditions.

Record Status of Going Fires

The lookout is usually the only member of the fire fighting organization who can observe currently all the changes and progress of a going fire. Clear and accurate description of the fire's condition is essential to permit the dispatcher to make correct decisions, to take follow-up action, and to give quickly such assistance to the men on the fire line as will insure control of the fire in the shortest possible time.

Report Definite Change in Fire

Keeping the dispatcher informed on the fire's progress is the lookout's job. It is largely on the basis of information furnished by the lookout that the dispatcher determines the need for additional help. The lookout should carefully observe the progress of the fire from the time it is first reported until it is "checked" out, and currently inform the dispatcher with accurate and clearly worded descriptions of any significant changes in its condition.

R-6 F. C. Hdbk.
Page Revised 9-6-48
No. 49

Changes such as a rapid or even steady increase in size, definite changes in velocity or direction of wind on fire, definite changes in color, volume, or character of smoke, or development from a ground fire to a crown fire, when this can be clearly discerned, are examples of definite changes which should be reported. In case of fast spreading fires, it is good practice to furnish frequent estimates on size of fire in acres.

Keep Chronological Record on Lookout Report Form and Diary

A chronological record of the fire's progress consisting of concise notations should be kept by the lookout on the back of Form 1-R6. Each entry should be kept by <u>date</u> and <u>time</u> observed. The record should show all significant changes in the fire throughout its duration, including estimates of size. This forms a valuable record and also allows the observer to develop his efficiency in sizing up future fires.

Notes should be kept on lightning fires which do not become established, showing how long the smoke was visible, the period of watching region, and the time it was considered safe to assume fire was out.

Determine Size of Fire by Estimate and Use of Firefinder

The size of small fires can best be estimated by comparing width of smoke base and volume of smoke with that of other fires for which the lookout has learned the true area. The lookout should check back with dispatcher on small fires observed until he can estimate their size with reasonable accuracy.

Larger fires may be estimated by use of the firefinder to determine the dimension at right angles to his line of sight by the tangent offset method and estimating the other dimension. To use the <u>Tangent Offset Method</u> proceed as follows:

- 1. Take accurate azimuth angles on both edges of the fire and reduce the intervening angle to minutes (See Fig. 13). (60 minutes = 1 degree.)
- 2. Multiply the number of minutes by $l\frac{1}{2}$, and the result by the number of miles from the observation point to the fire. The final result will be the distance in feet between the two edges of the fire. (Scale in miles the distance from the lookout station to the fire.)

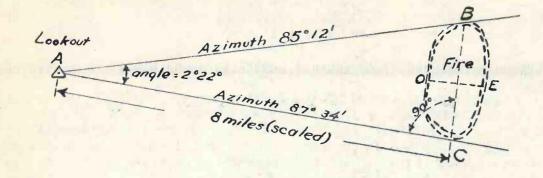


Fig. 13

A = Lookout station

AC = Line of sight to right-hand edge of fire (Az. 87° 34')

AB = Line of sight to left-hand edge of fire (Az. 85° 12')

Angular distance between lines of sight = 87° 34' - 85° 12' = 2° 22'

2° 22' converted to minutes = 2 x 60 + 22 = 142'

AC = 8 miles (scaled from map)

Applying the rule: Number of minutes x 1½ x number of miles

Tangent offset or BC = 142 x 1½ x 8 = 1704 ft. or one dimension of fire

Distance DE - estimated to be 800' - 1700 x 800 = 31 + acres or area of fire

Safety Rules - Lightning

Lookout houses and towers are protected against lightning according to specifications approved by the Bureau of Standards. The lookout should observe the following rules which have been included on Form FS-901:

GENERAL PRECAUTIONS

- 1. Check all lightning-protection installations at beginning of season and also after lightning storms.
- 2. Switch handles shall have rope throws to reduce chance of shock.
- 3. See Lightning Protection Handbook for methods of grounding, and for installation of radio antennae.

DURING STORMS NEAR LOOKOUTS OR OTHER BUILDINGS

- 1. Stay inside building, away from metal objects and walls.
- 2. Never use phone or radio when storm is overhead. Disconnect incoming telephone line by pulling the rope attached to the switch handle of the connection arrester.
- 3. Close and keep away from windows, doors, fireplaces. Lightning follows air currents.

DURING STORMS WHEN IN FIELD

- 1. Seek shelter in dense woods, grove of trees, if possible a stand of young growth, cave, depression in the ground, deep valley or canyon, or foot of steep cliff.
- 2. Sit or lie down.
- 3. Get under steel bridge, but never touch the steel; and never sit or stand on damp ground.
- 4. Get in an automobile.
- 5. Choose in this order, if there is any choice of shelter:
 - a. Large metal or metal-frame buildings.
 - b. Buildings with lightning protection.
 - c. Large unprotected buildings.
- 6. Keep away from:
 - a. Tops of ridges, hilltops, wide open spaces, ledges, rock outcrops, sheds or shelters in exposed locations.
 - b. Wire fences, telephone lines, and metal tools. If absolutely necessary to work on telephone line with lightning storm in distance, ground line in direction of storm before attempting repairs.
 - c. Large or lone trees.
 - d. Horses and stock.

Form FS-901 should be posted in a conspicuous place inside every lookout house or other exposes building.

FIRE CONTROL HANDBOOK REGION 6



PART II
PREPAREDNESS

CHAPTER 7
DISPATCHING

FIRE CONTROL HANDBOOK REGION 6

PART II

PREPAREDNESS

CHAPTER 7

DISPATCHING

PART II - PREPAREDNESS - CHAPTER 7

DISPATCHING

Table of Contents

	Page No.
Introduction	. II-7-1
Qualifications for the Job	. II-7-1
Advance Preparation. Know the District Know the Fire Plan Appraise and Train the Protective Force Train Fire Guards Train Crews Train Cooperators Execute Strength-of-Force Plans Maintain Fire Danger Rating System Check the Fire Organization Fire Guards Crews Cooperators Check the Communication System	. II-7-2 . II-7-3 . II-7-4 . II-7-4 . II-7-5 . II-7-5 . II-7-5 . II-7-5 . II-7-6 . II-7-6
Fire Equipment	. II-7-7
Dispatcher's Equipment	. II-7-8
Action on Going Fires Receiving the Lookout's Report. Cross Shots Plotting. Single Fire With Cross Shot One-Shot Fire Group Fires. Panoramic Photographs Determine Responsibility Other Protective Agency Operators and Landowners.	II-7-10 II-7-11 II-7-14 II-7-14 II-7-15 II-7-16 II-7-16
Sending Men and Equipment. Single Fires. Instructions to Smokechasers. Follow-up Group Fires Large Fires.	. II-7-18 . II-7-18 . II-7-19 . II-7-19

Table of Contents (Cont'd.)

	Page No.
Checking "Out" Fires	II-7-22
Records on Going Fires	II-7-22
Chronological Record	
On Small Fires	II-7-22
On Large Fires	II-7-23
Aids to Keeping Posted on Fires	II-7-23
Wall Map	II-7-23
Three-Basket System	. II-7-24
Form 929 Fire Report	II-7-24
Other References	· .*II-7-26
Dispatching Check List	II-7-26 *

DISPATCHING

Introduction

Dispatching comprises many activities which affect the speedy control of fires. These activities include keeping the fire-fighting organization and equipment properly prepared, keeping advised on burning conditions and weather, obtaining reports on fires, determining the location of every fire reported, weighing the probable difficulties of control, and sending such men and equipment as current conditions require to control and completely extinguish it within prescribed standards.

The dispatching job is the hub around which all fire control activities on the ranger district revolve. It involves guiding the actions of the protective forces so that all efforts will be properly directed toward the attainment of the general objectives. It is an all-important link in the chain of fire suppression, and the caliber of the man filling the job may be measured by his ability to consistently reach prompt and correct decisions on each dispatch of men and equipment to going fires.

*The duties of dispatching are customarily assigned to the ranger district assistant or ranger district clerk, with such assistance by the district ranger as conditions require. Actual dispatching may be done by one of the above or any other qualified personnel available. *

Qualifications For the Job

The dispatcher fills a highly complex job. He should possess certain exceptional characteristics in addition to having a broad, fundamental knowledge of all phases of fire control work.

- l. <u>Personality</u>: The dispatcher should possess a pleasing personality to enable him to meet tactfully and diplomatically the people with whom he deals. He must be in constant communication with the protection organization, and often he will be required to seek the assistance of cooperators and to communicate with administrators of other protective agencies. It is essential to maintain favorable relationships with all.
- 2. <u>Judgment</u>: Each dispatch of men and equipment requires careful weighing and checking of the situation. Clear-cut, accurate decisions based on logical analysis of all available data are essential to doing the job well, particularly during peak loads. Under high-pressure conditions, it is imperative the dispatcher possess a temperament which will permit him to remain calm and to think clearly so that he may arrive at intelligent decisions quickly. Judgment should be his watchword.

- 3. Administrative and Training Ability: The dispatcher should know the capabilities for fire suppression work of each man in the protective force. He should be capable of training each man effectively on any deficiency discovered. Since he will regularly give instructions to all members of the protective force and to cooperators whose assistance is obtained, he should be able to give clear and definite instructions which will be accepted; and followed without question by those who receive them. He should be thoroughly familiar with all phases of fire control work and with travel, burning, and other conditions on the district.
- 4. Organizing Ability: The dispatcher should have capacity and aptitude for arranging in orderly fashion all information on resources needed to do the job properly. During peak loads, it is essential he use a systematic method of compiling clear and complete records which will enable him to place the numerous details in proper order to insure follow-up action on every fire. There are too many details to trust to memory; they must be recorded to avoid mistakes. Under these conditions success will be determined by ability to organize the work and keep clear, legible records.
- 5. General: The dispatcher should be alert, energetic, and capable of working long hours under strain in emergency. He should be willing, honest, reliable, and conscientious. He should have loyal enthusiasm and an aptitude for attending to routine detail during dull periods without becoming irritable.

Advance Preparation

Readiness at all times to meet the probable dispatching load requires a great deal of advance preparation.

Know the District:

The dispatcher should know the district intimately, so he can visualize intelligently the conditions and problems which will be encountered in the suppression of any fire occurring within the protective area. He should know the fuel types, their locations in the district, their rates of spread and resistance to control for any given condition. He should know the location and current condition of all roads and trails so he can estimate correctly the travel time to any point. Likewise, he should know the topography and cover conditions, to make for acceptable estimates on cross-country travel. This is equivalent to knowing not only the travel coverage of each individual position but also coverage from centralized points to all parts of the district. He should know the blind areas and the detection coverage from all lookout stations, including adjacent cooperator points. He should know the high value areas.

*Much of this information is available in the Fire Control Management Plan binder for the district, but it is important that this material be supplemented with personal, up-to-date knowledge, particularly with regard to travel routes. A thorough grasp of all these will aid the dispatcher in arriving * quickly at correct decisions when dispatching to fires. He should keep currently informed on all activities in the unit which will affect the <u>risk</u> or probability of fires starting, and he should be thoroughly familiar with methods of calculating probabilities.

Know the Fire Plan:

The dispatcher must know the general objectives of fire control as set forth in the Fire Control Handbook and how they are applied in the district fire suppression plan.

*The district fire suppression plan (See Manual, NF-A, R-6 502.2; and F. C. Hdbk., II-1) is a plan of action, based on experience and all *known data, carefully prepared in advance of the fire season, which provides for the complete organization and use of all equipment and man power available to the district in the event of a heavy fire load resulting from one or more large fires or many small ones. The suppression plans for all districts on the forest are combined to form the major part of the forest fire suppression plan. Complete use of facilities set forth in the district plan should be made by the dispatcher to meet emergency needs, after which request should be made to the supervisor's office for assistance as required to fully meet the anticipated load.

The district fire plan is the dispatcher's key to securing ready assistance in an emergency, and it is imperative that he be constantly familiar with its provisions and changes. It should be systematically and currently maintained so it will show correctly at all times the man power and equipment available. If one or more individuals listed in the plan move from the community, or even become unavailable for short periods, provision should be made for prompt revision of the plan. The urgency of keeping the district plan up to date is accentuated by the fact that it is a part of the forest plan.

It is essential effective interchange of necessary information take place between protective agencies whose units join. This requires satisfactory relationships between such cooperating agencies. Since the dispatcher is apt to contact other agencies regarding fires, he should keep thoroughly informed of any written cooperative agreements or understandings which have been entered into with them. In addition, he should know how to reach quickly the designated individuals in authority in the cooperating agency. Each agency should designate two or more alternates to receive calls about fires.

Appraise and Train Protective Force:

The normal fire load usually will be handled by the regular guard force and suppression crews. The extent to which they are able to handle the job effectively will depend largely upon the capabilities of the various individuals. The dispatcher should know the capabilities of each guard or crew, as this knowledge will often govern the amount of

follow-up assistance he should send to fires for which they are responsible. The dispatcher will usually be made responsible for determining what additional training each man in the regular protective force requires and for giving such training by accepted methods as is delegated to *him. (See R-6 Training Hdbk., Chapter I, for methods of training) *

The first step in training is to make an appraisal of the persons to be trained. Then it can be determined at what level the training should begin to bring each individual up to an acceptable level of proficiency. For those who attended Guard Training Camp, the records will indicate in what subjects each guard demonstrated a satisfactory degree of proficiency and will aid the dispatcher in making the appraisal of this group. With these records and by test "in place" or over the telephone, the dispatcher will determine at what point in each subject additional training is required. Training requirements should be indicated on the individual Guard Training Plan and Inspection Outline *form and a plan of action formulated for execution. (See R-6 Training Hdbk., Chapter I) The dispatcher will be concerned with the training * of three groups of fire suppression forces.

Train Fire Guards: The regular fire guards are usually the first men to discover and arrive on a fire and their individual efficiency often determines the course of a fire. Each should be trained to the highest degree of efficiency possible. Since only preliminary training in subjects suited to group instruction can be given at guard training camp, it is essential to give adequate follow-up training. Follow-up training should be individual instruction, designed to round out the knowledge of each guard so he will be competent in all phases of the fire-fighting job which he is expected to do. This will require constant review to firmly fix the knowledge gained. Training by telephone will be the principal means available to the dispatcher. His resourcefulness and ability as a trainer can be measured by the success he attains in accomplishing the training assigned to him.

All training should be carefully planned, but this is especially important for training by telephone. The dispatcher should use the best methods and devices which his ingenuity can develop. Whatever self-training he can initiate makes his job that much lighter, but he must currently employ some systematic method of determining how much has been learned. The protective force should be completely trained as early in the fire season as possible.

*Train Crews: All road, trail, or other crews employed in *
the district are potential fire suppression crews. Such crews usually
constitute the dispatcher's first reserve of trained man power. Each
crew should be thoroughly trained in fire-fighting technique as a crew
and, in addition, as individuals for fire-fighting jobs which they may
be called upon to do. On large fires the crew may function as a unit, or
the individual members may be used as truck drivers, tractor operators,
or pump operators. On a series of lightning fires, a crew will frequently
be broken into smoke-chasing units, or qualified individuals will be used
to man emergency positions or replace regular guards. It is essential

the training be done in advance of actual need so the crew or individual members will function efficiently in the jobs assigned them during the emergency. The crew foreman, with available assistance, will usually be designated to give the training, but the dispatcher should know currently the status of training both as a crew and as individuals for special jobs. A systematic method of obtaining and recording current information on their training and qualifications should be used.

Train Cooperators: The cooperators listed in the fire suppression plan are usually the dispatcher's second reserve of man power, to be used as emergency lookouts, smokechasers, truck drivers and pump operators, or crews for fire fighting. The dispatcher should know the qualifications of the special men so he can use them where they will do the most good. Training of cooperators is accomplished by one or more of several methods. A few key cooperators frequently attend a regular Guard Training Camp; special training schools are held to train key individuals or crews; and cooperators are sometimes given handbooks or other material so they may train themselves in methods and techniques. The dispatcher should record information on who has been trained or is qualified, for use in emergency periods. For example, if the dispatcher needs three men to replace regular smokechasers sent to fires, he should be able to turn to his records and determine immediately those who are available and qualified to fill the positions.

Execute Strength-of-force Plans:

Strength-of-force plans show the number and location of men which it is deemed necessary to have on duty, or other specific action to be taken for each combination of burning index, visibility, and risk, to give satisfactory protection to the unit. The action provided for in these plans represent the best combination of facts, judgment, and experience available for the ranger district. It is the dispatcher's best guide and should be conscientiously followed.

Maintain Fire-Danger Rating System: Fire-danger rating is a system of evaluating the seriousness of fire conditions. It is the key to executing the strength-of-force plans. The rating must be made regularly and systematically and the data carefully correlated with the weather forecast and such other available information as is needed *to properly weigh the situation. (See F. C. Hdbk., II-5) *

Check the Fire Organization: The dispatcher should know the location of all protective men at all times so he will know what forces are available for redeeming his responsibility in meeting objectives set forth in the strength-of-force plans. This requires current checks, the standard for which will vary with the different groups involved.

<u>Fire Guards</u>: The dispatcher will check all fire guards on duty at least twice daily in accordance with a prearranged schedule.

During the daily checks each guard will be given the correct time and instructions needed to meet special conditions. During favorable weather, the dispatcher will ordinarily assist the guard to accomplish his job list by advising him when he may be gone from his station. The dispatcher will supervise currently the use of check-look schedules and supplemental detection points by lookouts, and patrol schedules by designated guards, to insure that they are properly synchronized with the strength-of-force plans. All instances of guards *leaving their stations for supplies, water, or other purpose will be * reported to and properly correlated with the strength-of-force plans by the dispatcher.

If important changes in conditions are impending, as when a lightning storm or strong winds are forecast, the dispatcher should check with the guards and others so the entire fire control organization will have advance warning and can be "tuned" to readiness. He will make arrangements for the guards to advise him of the approach of lightning storms so he can take action in accordance with the strength-of-force plans. He will arrange for interchange of this information with adjoining units.

During fire weather the dispatcher will keep advised as to the whereabouts of the district ranger and any other forest officers in the district. Forest officers traveling within the district should advise the dispatcher of their schedules.

<u>Crews</u>: The dispatcher will keep advised on the location *and disposition of all suppression, improvement, or other crews * employed in the district. He will arrange for standby or other appropriate disposition of such crews whenever conditions require, as provided in the strength-of-force plans. He should arrange to obtain immediately and record any information which will affect the availability or effectiveness of a crew or its individual members for fire suppression, such as changes in key personnel, number of men, or location of work.

Cooperators: Throughout the fire season the dispatcher should follow a carefully prepared plan of checking cooperators. Ingenuity and resourcefulness are needed to keep the individual cooperators active and fully conscious of their place in the organization. A method should be employed to keep the key individuals in this group constantly alert to the fire situation and properly interested to do their job. More attention must be given to individuals who are to be used in specialized jobs, as smokechasers or timekeepers, than to those who are expected to fill labor jobs; likewise, organized crews, as those at sawmills or other places

where they are regularly working together as a group, require less attention than farmers who do their regular work as individuals. The organization of a cooperator crew should be such that the leader will keep a constant check on the members, so the entire crew can be checked by a single contact with its leader or someone designated to assemble the crew. Perfecting the organization of cooperators to the point where it can be maintained as a constantly alert and functioning fire suppression crew is a challenge to the resourcefulness of the person responsible, and every known method should be employed to make it effective.

Whenever the fire situation develops to the point where it appears probable that cooperators may be needed, the dispatcher should check on their availability and to what extent he can depend on them. The need for their services should be anticipated as far as possible in advance, to permit them to make the best disposition of their own work. This will speed up action in placing them on the fire. The best way to impress the value of the cooperator organization on its members is to use them in a logical and worthwhile manner in emergencies.

Check Communication System: As the nerve center of the fire organization, the dispatcher must know throughout the fire season the current condition of all communication facilities on which he depends to reach his suppression forces. Ordinarily these will include all the communication facilities within the ranger district. Each such facility should be checked at least once daily. This will be accomplished for the most part in conjunction with the check of the protective force. If important segments of the communication system are not tested in this check, provision should be made to insure regular and systematic_checking.

When defect in any part of the communication system, as abnormal cross-talk, difficulty in hearing or ringing, or complete failure, is discovered, the dispatcher should take steps immediately to have it corrected. He should assure himself that each guard understands the action he will be depended upon to take, as provided in special instructions for the station, in cases where a total failure of communication occurs. Communication is essential to the dispatcher's work, and he should take the responsibility for keeping it in operation.

Fire Equipment:

Equipment needed in the suppression of fires is of equal importance with man power. The dispatcher must know the location, quantity, condition, and availability of all equipment needed to suppress fires within the unit. This includes all suitable Forest Service and cooperator's equipment.

Forest Service Equipment: At the beginning of the fire season, the dispatcher will make sure all fire tools and equipment in the district are located according to planned needs, have been properly conditioned, and are ready for use. He will reassure himself of this throughout the

season. When tools and equipment have been used on fires, he will make sure they are quickly reconditioned, reassembled, and again made ready for use. This might include replacements. The guards will be checked in place or by telephone to make sure their equipment is properly maintained. The dispatcher will keep informed on the procedure for securing supplemental equipment as needed through the supervisor's office.

Cooperator Equipment: The dispatcher should keep currently advised on the location, condition, and availability of all cooperator tools, tractors, trucks, horses, and other equipment, in the same way that he checks currently the availability of cooperators. He should also obtain current information on new equipment which is made available. The check on equipment and cooperators may be done at the same time, particularly when owners of such equipment are also listed as cooperators. The important thing is to know currently what is available and have it arranged for by agreements. This will prevent overlooking the use of needed equipment during emergencies and will lighten the load on the dispatcher during peak load conditions when all available energy is needed for directing action on fires.

Dispatcher's Equipment:

Each dispatching station should be equipped with the articles needed to plot and record fires accurately. The dispatcher should keep these articles handy and ready for instant use throughout the fire season. They will include the following:

- 1. Plotting Map: R-6 standard, $\frac{1}{2}$ —inch scale base map of ranger district. (Note Each spring the map should be cleaned thoroughly, corrected, and brought up to date, and then given a thin coat of a good grade of clear varnish or shellac).
- 2. <u>Protractor</u>: Standard, eighteen-inch, semi-circular brass or full 360° transparent protractor with fitted pin. A retractable pin to permit protractor to slide over map without being picked up is usually preferred. A ruler for use with the protractor is necessary for long distance shots. It is usually of steel.
- * 3. Forms 2-R6: A supply of Dispatcher's Action Record forms. * These forms should be kept numbered ahead. They should be kept in the same place at all times, so the dispatcher will automatically pick them up without hesitation or search.
- * 4. Pencils: A supply of pencils, some sharpened with round and some with chisel points. A good practice is to keep one pencil attached by a string to the protractor pin. *
- 5. <u>Wall Map</u>: A fireman's or other suitable map mounted on soft wall board, on which fires will be posted with appropriate tacks.

- 6. Tacks: Tacks for use in the wall map are of two kinds:
 *(a) approximately ½-inch yellow flat-heads with consecutive numbers corres- *
 ponding to lookout report form numbers to indicate going fires, and (b)
 small, round-head, colored tacks to indicate the location and size classes
 of fires that have been checked out.
 - 7. Photographs: A set of panoramic photographs for each lookout station in the district, properly filed for convenient use together with scale for plotting vertical angles. If available, the dispatcher should have a set of vertical aerial photographs and stereoscope.
 - 8. Three-Compartment File: Any convenient, three-compartment file basket, to be used for segregating fire reports (Forms 2-R6) into (a) new reports, (b) reports on which action has been taken, and (c) reports on "out" fires which still must be checked. The three-compartment file can be made from three large manila envelopes properly fastened together.
 - 9. <u>Telephone:</u> A telephone set which will be convenient for use with the plotting board. It should be provided with a long cord so the dispatcher may use it while looking at the plotting board. Head phones and chest transmitter are very convenient.
 - *10. <u>Informational Source Data</u>: All informational material, as Fire Suppression Plan, Fire Control Management Plan binder, Fire Control Handbook, NF-A section of the Manual, Guard Placement Plan, R-6 Training Handbook (Chapter I), cooperative agreements, fire control plans for areas of special hazard, and any other data needed to do the job, should be kept in order and convenient for ready reference. *

The plotting board, protractor, scale, and pencil should be kept in constant readiness throughout the fire season. The plotting board in particular should be kept clear of all books, papers, and other material not connected with its principal use. The plotting board should be convenient to the telephone and where the light will be good day or night.

Action on Going Fires

The dispatcher who is fully prepared has a firm grasp of the situation and is ready at all times throughout the fire season to use efficiently all the resources available to him whenever conditions require. He will recognize the approach of emergency situations and, when fires occur, he will take specific and appropriate action.

Receiving the Lookout's Report:

The data from the lookout's report on a fire is recorded on the *Dispatcher's Action Record, Form 2-R6. The data from the first lookout * reporting should be recorded in the first column for items (1) to (11) inclusive (See instructions on the form). As soon as this information is received, the dispatcher should give the lookout the fire number and the report time, recording the latter on his Form 2-R6. Later he should furnish the name of the fire to the lookout.

The information should be accurate and complete. It should be legibly and completely recorded so no question will arise later as to its meaning. Short abbreviations and unintelligible writings may lead to misinterpretations. The dispatcher and lookouts should practice until the latter can send and the former can record a complete report in from one to three minutes.

If a lookout seems to be unduly excited, the dispatcher should calm him as much as possible before taking the report and insist on checking the items carefully to insure accuracy. On initial reports received from persons outside the Service who later may not be available, as complete and accurate information as possible should be obtained, as this information may be the last obtainable before action is taken.

Cross Shots:

To locate a fire accurately, cross shots are obtained whenever possible. A lookout can determine accurately the angular direction from his station to a plainly visible fire with the firefinder, but to fix the fire's location he must estimate the distance by correlating available landmarks with the map. Two accurate, angular measurements taken at approximately right angles to one another determine the fire's location without use of the estimated distances.

As soon as possible after receiving the first report, the dispatcher should secure a cross shot, if possible, from another lookout who best sees the area in which the fire is located. When he has a choice between two or more lookouts who have equal coverage in the area, he should first select the one whose azimuth reading on the fire will give the best intersection. Two accurate shots with intersecting angle of from 60° to 120° will give a satisfactory location on one fire, and ordinarily the dispatcher should not take time to get more unless specific need exists.

Data from one cross shot should be recorded in the second column of the same Form 2-R6 on which data from first lookout was recorded. If a second cross shot is obtained, it should be recorded in the third column. Complete information should be recorded for cross shots, especially when there is a possibility that more than one fire exists. If two or more fires are being plotted and azimuth lines are crisscrossing, all the data are needed to determine at which intersections fires exist.

All reports on the same fire should be assembled on the same Form 2-R6 if possible. If it develops that reports on one Form 2-R6 represent two fires, another form should be filled out at once for the second fire and the data for it crossed out on the first form. If it is found that *two or more Forms 2-R6 have been made on the same fire, they should * all be stapled together under the number of the first one received.

Plotting:

Plotting consists of determining as accurately as possible the location of fires on the plotting board map. This is usually done by carefully determining the intersection of two or more azimuths that have been measured on lookout firefinders, but often it is done by the use of one azimuth and a distance when this is all that can be obtained.

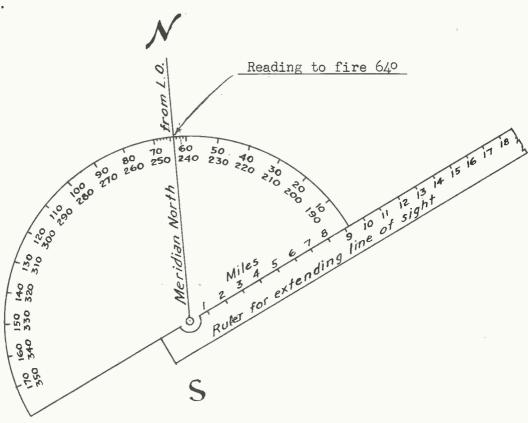
The standard plotting board for determining the location of fires consists of a $\frac{1}{2}$ " base map of the district mounted on sheet steel with a

R-6 F. C. Hdbk. *Revised 9-20-50 No. 61 bored hole accurately centered at each detection point. A true north and south reference meridian is drawn with red ink through the center of each point before the hole is bored. The dispatcher also usually has an 18", semicircular protractor equipped with pin to fit the holes in the plotting board.

In plotting an azimuth, the protractor pin should be placed securely in the hole representing the lookout station reporting. Revolve the protractor until the given azimuth as read on the protractor scale coincides with the reference meridian. The reading should be carefully taken. With the protractor in proper position, the straight side designates the lookout's line of sight.

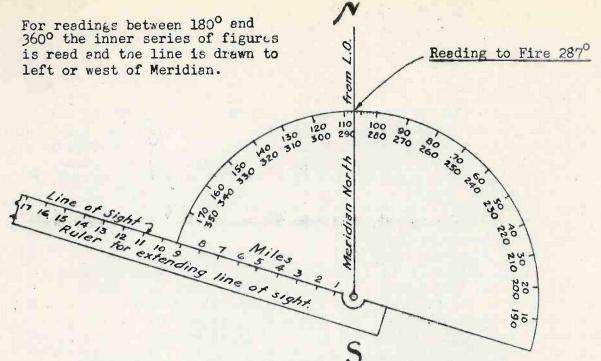
In using the semicircular protractor, it is more convenient to read the azimuth on the meridian line extending north from the lookout station than on the line extending south (See Figures 1 and 2).

For readings between 0° & 180° the outer series of figures is read and the line is drawn to right or east of Meridian.



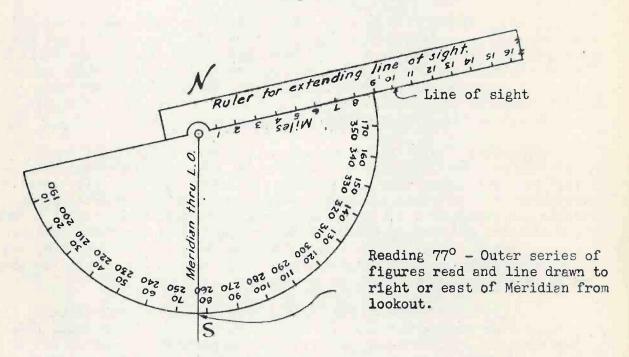
Using the protractor with meridian north from lookout, readings between 0° and 180° .

Fig. 1 II-7-12



Using the protractor with meridian north from lookout, readings between 180° and 360°.





Using the protractor with the meridian extending south from the lookout. For readings from 0° to 180° the outer series of figures is read and the line drawn to right or east of the meridian; for readings from 180° to 360° the inner series of figures is read and the line drawn to left or west of the meridian. Since the protractor must be read upside down, care must be taken to read the figures in proper sequence or progression.

Fig. 3.

Single Fire with Cross Shot: In plotting a single fire with two or more azimuths, all of which have been taken on the fire base, the dispatcher should carefully lay out the azimuths and project the lines representing the lookouts' lines of sight until they intersect. The point of intersection represents the location of the fire. The location is most reliable and intersection of lines is most distinct when these lines intersect at an angle of 90°. The location becomes progressively less reliable as the angle of intersection departs from 90°. Other things being equal, more weight should be given to the shots which intersect at an angle approaching 90° than to those which intersect at a smaller or larger angle.

If, in plotting three azimuths to a fire it is found the points of intersection do not agree, it is usually best to accept the two which form the better intersection. This condition indicates something is wrong with one or more of the stations reporting, either in the orientation of their instruments or in the location of the holes in the plotting board representing their locations. At the first opportunity the dispatcher should attempt to find the cause of the error and correct it. He should keep records on tests made and seek advice from qualified individuals when he cannot determine where the error occurs.

In plotting a fire from two or more azimuths where one or more of the stations reporting cannot see the base of the fire, more weight should be given to the shots taken on the base than to the others. Shots which parallel the direction of smoke drift are usually more reliable than those at right angles to smoke drift. Where the fire base cannot be seen by any of the reporting stations, the best correlation of right angle intersection and smoke drift should be made.

One-Shot Fire: If for any reason a reliable cross shot cannot be obtained, the dispatcher should check the available information carefully so he can make the best possible determination of the fire location. Usually, this will mean checking carefully the location by local landmarks and correlating this with location by township, range, section, and sub-division as given by the lookout; also the use of panoramic or other photographs available. If all data furnished by the lookout checks, and the description is clear and complete, the dispatcher may assume the location is as accurate as possible to obtain.

If the location carefully plotted from the azimuth and distance furnished by the lookout does not check with the location by local land-marks and legal subdivision given by him, there must be an error in the data. In these cases the dispatcher should determine where the error occurs - azimuth, distance, or location by legal description only. These checks should be made for all lookout reports but are especially important for one-shot fires.

Often the dispatcher will call the lookout to obtain a more specific or complete location by local landmarks, as in one-shot fires this is frequently more reliable than the distance reported. Where fires occur

near natural barriers, as rivers and impassible canyons, it is extremely important to determine accurately on which side of such barrier the fire actually is.

Group Fires: In plotting a group of fires, the dispatcher's judgment, resourcefulness, knowledge, and patience are often strained to the limit. Involved situations require clear and complete analysis of all available information to establish definitely the locations of all fires discovered. Frequently a situation is complicated by the fact that all reports are not available at the time action is required. The dispatcher should, if possible, first determine the number of fires that exist and then determine roughly the location of each by use of local landmark data. The preliminary fire locations should be spotted on the plotting board map. This will eliminate much of the confusion which otherwise may develop due to numerous intersection of lines (See Figure 4). Determination of the total number is much simplified when at least one of the reporting stations can see all the fires, but when this is not possible, usually the number can be definitely established by clear and careful analysis of the locations by local landmarks and description of fires as reported by all stations. With this done, the plotting may proceed in much the same manner as for single fires. Each fire should be considered separately, and due weight should be given to each report. The important thing is to keep cool and proceed with the plotting as quickly as possible consistent with the exercise of good judgment and efficient results.

Group fires commonly result from lightning storms. Under all conditions, the dispatcher should take sufficient time in plotting to establish the location of fires with reasonable certainty, but in plotting a group of fires this is especially important because of the greater chance for error and the probable need for all available man power. A smokechaser sent to a wrong location is often lost to the organization for the duration of the emergency.

Plotting three fires from three lookouts (all fires seen by each station) results in a network of intersecting lines (See Figure 4). This illustrates the importance of determining the number of fires existing and their approximate locations before plotting the azimuths so as to determine readily what intersections represent fires. Under the conditions given, each fire occurs at the intersection of three lines of sight, which is important in eliminating all two-point intersections in this example. But note that "A" is also a three-point intersection although it does not represent a fire. Good judgment and clear analysis of all obtainable facts are essential to satisfactory solution of such involved situations.

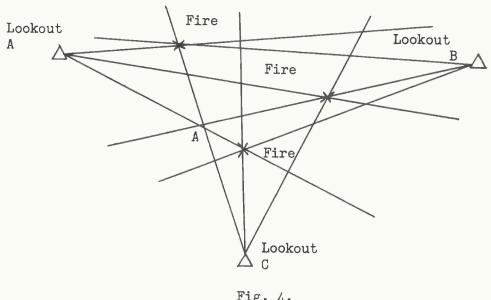


Fig. 4.

Panoramic Photographs:

Panoramic photographs can be used to advantage in connection with one-shot fires, fires discovered at night or during periods of restricted visibility, or in other situations when determining the location of fires is difficult. These photographs are usually taken under proper weather conditions to show the topography clearly. They are a great aid in reaching an understanding on description of a location, both from the lookout to the dispatcher and from the dispatcher to the smokechaser. persons connected only by telephone or radio, each having a copy of the same panoramic picture, can describe accurately to each other any specific location on it by use of the horizontal scale printed on the photograph and the vertical angle scale (See directions on vertical angle scale). Proper use of panoramic photographs will aid the dispatcher in visualizing the conditions as they appear to the lookout. Full use of them should be made whenever the need arises.

Determine Responsibility:

Generally, forest fires occur within recognized protective units or areas which are under organized fire protection by some responsible protective agency. Each recognized agency is responsible for seeing that fires are suppressed within its protective unit boundaries. It is the policy of the Forest Service to cooperate fully with other protective *agencies in fire control activities (See Manual, NF-A, R-6 601.1 for * policy and instructions).

After establishing the location of a fire, the dispatcher's next duty is to determine who is responsible for its suppression. He should take immediate initial action (as provided in the district fire plan and in cooperative agreements) on all fires within one mile of the district R-6 F. C. Hdbk.

*Revised 9-20-50

No. 61

protective unit and in certain other cases at greater distances, as provided in the Manual. Fires discovered in other protective units should be promptly reported to the responsible agency.

Other Protective Agency: The dispatcher should be familiar with adjacent protective units and the agencies protecting them. He should be familiar with any existing general cooperative or special agreements between the Forest Service and neighboring agencies and be guided by their provisions. He should transmit complete information promptly to a responsible representative of the agency in whose unit he has plotted a fire. He should then record on Form 2-R6 the time and the name of the person to whom the fire was reported, and any other pertinent data needed to complete the record. Such Forms 2-R6 should be conspicuously marked with the name of the responsible agency and filed separately from those for fires in the Forest Service areas.

Operators and Landowners: Logging operators have certain specific responsibilities for the suppression of fires occurring within their operating areas or within areas of slash resulting from their operations. When a logging operation is on national forest lands, the operator's responsibilities are covered in the timber sale fire plan and contract. For logging and clearing operations on private, state, or county land, the responsibilities of operators and landowners are *covered by state law. (See F. C. Hdbk., I-3). Whenever a fire occurs * anywhere which endangers lands protected by the Forest Service, appropriate action should be taken to safeguard them from damage, but at the *same time notice as required by law should be given the responsible parties. (See Manual, NF-A, R-6 601.1; the above handbook reference; and * Form R6-11). The dispatcher should know the provisions of timber sale contracts or other agreements with operators as well as the legal responsibilities of operators, landowners, and the Forest Service, and should rigidly follow the instructions in the Manual and the Fire Control Handbook.

The dispatcher should have access to reliable fire status and ownership records. When in doubt as to responsibility, he should promptly seek advice from his superior officers. Owners of nonforest lands (grass, cultivated fields, or sagebrush lands which have not been placed on the tax roll under the State fire laws) are responsible for preventing fires from escaping therefrom and damaging adjoining lands (See above references). The dispatcher should have ready access to reliable ownership lists of any such lands within or just outside the district protective boundaries, so he can determine responsibility quickly.

Sending Men and Equipment:

As soon as the dispatcher has established the location of a fire and has determined that he is responsible for suppression action, his next duty is to send to the fire immediately, day or night, the nearest man in travel time and to follow up with such additional

men and equipment as is required to insure control of the fire within established standards (See Fire Control Handbook, Part II, Chapter 9). Whenever positions that are important under the anticipated conditions are vacated by such action, the dispatcher should take immediate steps to have them effectively manned as soon as possible, as provided for in strength-of-force plans. Under dangerous conditions, he should be prepared at all times to obtain replacement for key positions quickly. This means expert use of the fire suppression plan, constant appraisal of the situation, anticipating needs, and arranging in advance for qualified men and crews to be placed at strategic locations where their services will be quickly available.

Fire situations may be divided into three general types: first, the single fire; second, group fires; and third, the large fire. Each will be treated separately.

Single Fire: Single fires are usually man-caused or from "hang-over" lightning. These often occur when the burning index is high, and prompt, vigorous action is necessary to suppress them while they are small. Frequently they are potentially dangerous, and unless proper action is taken quickly, they may develop into large fires. Fortunately, the dispatcher usually has the entire district protective force at his disposal, and if the situation requires, he can send men from several locations to insure control of the fire without unduly endangering the remainder of the district.

Instructions to Smokechasers: A smokechaser customarily takes the initial action on a fire, and the dispatcher should make sure that he has all available information necessary to find it. He should insist that the smokechaser write down the complete lookout report data, spot the fire location on a map, and specifically plan the route of travel to the fire before leaving the station. He should also insist that the smokechaser read back this information to make sure it is correct and clearly understood.

When instructing those going to fires, the dispatcher should practice giving clear, understandable directions, and he should use a reasonably slow, well-modulated voice tone that will inspire confidence, and be understood and convincing. Speed is desirable, but efficiency and accuracy are essential.

On one-shot fires the smokechaser should be given the benefit of the dispatcher's best judgment in helpful suggestions for finding it, but he should be warned that the fire was seen by only one lookout and search should be made along the line of sight in both directions from the location—given because of the probability of over or undershooting. The smokechaser should always be given the most helpful local landmarks with which to find a fire. This is particularly important on one-shot fires. The dispatcher may direct the smokechaser to go directly to some specific point, as a bridge, section corner, section—line board, or other landmark,

and run a compass line from there. This should be done when it is the surest way of finding the fire. The dispatcher should be sure that the point can be readily found, and he should give the smokechaser the azimuth to use, as it can be more accurately determined on the plotting board than on the smokechaser's map (See Fire Control Handbook, Part II, Chapter 8, for additional suggestions).

In some cases the dispatcher may instruct the smokechaser to travel by a certain route and pick up men to take with him. When this is done, it should be clearly understood where the men are to be secured, the number to take, and specifically what the smokechaser is to do in case he has difficulty in getting the help.

If he wishes to obtain additional information and not slow up the travel time of the first man to go to a fire, the dispatcher may send the smokechaser to a specific telephone (if one is located along the route of travel) with instructions to call in when he arrives. The dispatcher can obtain the information while the smokechaser is traveling toward the fire, and can give him the best report available when he reaches the telephone. If the dispatcher finds the first man sent to a fire left with the wrong information, which will affect finding the fire, he should send at once the next nearest man in travel time.

Follow-up: As soon as the first man has been sent to a fire, the dispatcher should endeavor to determine the probable progress of the fire and should send such reinforcements as, in his judgment, will be required to control it within established standards. In estimating fire behavior, he should use all available information, such as the fuel types and topography in which the fire is burning, travel time required for the first man or crew to reach it, time of day, burning index, and weather forecast or expected weather influence, affecting its rate of spread and resistance to control. He should keep currently posted on the actual progress of the fire by obtaining special or periodic reports from lookouts or other sources. He should reappraise the situation whenever the facts justify and continue to send reinforcements as needed.

The dispatcher should record on the back of each Form 2-R6 specifically what action has been taken on the fire. This information should be recorded by time and include the name of the man in charge, the number of men sent, any special equipment, and any other pertinent information which will be of help in keeping abreast of the situation and furnishing supplies or other aid as needed. All crews in the field are depending on the dispatcher to send them the supplies or other aid needed to do their job, and he should not let them down. Above all, he should maintain his organization so that he will know in advance where he can get men and equipment quickly to place on any fire which shows a tendency to develop to serious proportions, or to handle new fires that may be discovered. He should reorganize his original protective force and equipment as quickly as possible after they return from a fire so as to be ready for an additional load.

Group Fires: Group fires customarily occur as a result of a severe lightning storm and may occur in such numbers that there are

insufficient experienced smokechasers to man them. These situations demand the exercise of good judgment and resourceful planning. The dispatcher should carefully appraise the situation as early in its development as possible, so he can utilize the services of his most capable men to the best advantage. Based on the best information obtainable, the severity of the situation should be weighed by such things as the extent and intensity of the storm, the amount of moisture that accompanies it, and general burning conditions. He should notify his superior so that plans can be made to obtain outside help if necessary. The emergency men and crews listed in the fire suppression plan should be lined up for quick call, and when conditions warrant, should be moved to strategic locations in or near the storm area from which they can be sent quickly to fires.

It is frequently necessary to use the best smokechasers to find lightning fires, but this class of fire often occurs in an area of low or moderate hazard. Faced with a large number of lightning fires, the dispatcher should be careful not to dissipate his competent smokechaser forces too quickly. He should size up the situation and send at once a capable man with a sufficient crew to control each of the potentially dangerous fires, as those located in old burns, slashings, or other dangerous fuels. Such crews may be composed of men less experienced in finding fires.

A reasonable time may be taken to organize for action on those fires known to be burning in low-hazard areas, particularly when rain has accompanied the storm. Under these conditions it is sometimes best to place several inexperienced men under the direction of an experienced smokechaser who will take them to the fires, drop off sufficient men to extinguish each, and give control and mop-up instructions to each group so placed. If the fires are conveniently located, the smokechaser may work from one fire to another and supervise the work on all, or at the direction of the dispatcher he may return to some predetermined location where he will be available for additional assignments. One experienced smokechaser has been known to place crews on six fires in a few hours.

In a group-fire situation it is extremely important that each man responsible for finding a fire be given the complete and accurate information needed to find it, because under these conditions confusion is apt to exist and the dispatcher wants to be sure each smokechaser finds the specific fire to which he is sent, to insure that all fires are covered. The dispatcher should insist that complete information go with each smokechaser in written form.

Follow-up action on group fires should be the same as outlined for the single fire, which makes it imperative the dispatcher use a systematic method to insure all fires are properly manned.

The serious group-fire situation constitutes the heaviest and most complex load a dispatcher is called upon to carry. Cool, clear

action is essential to his best performance. The numerous details of obtaining and sending men, supplies, equipment, and transportation as well as appraising each of the numerous fires and correlating the action thereon, may easily project the load beyond the capacity of any one man. The dispatcher should obtain the help required to handle all "behind-the-line" activities, including assistance in plotting and keeping adequate records. At the same time, he should keep his superior advised of conditions so help can be sent from the outside when needed. This help may come from the Supervisor's office or from other sources. In any event, the dispatcher is responsible for carrying the load until such time as he can be relieved. The records of his action should be compiled with the objective of having them clearly reflect the status of each fire to the relieving officer.

To summarize, in group-fire situations the dispatcher should carefully appraise the situation, anticipate the load, and make the best possible use of all his suppression forces. He should make his preparations as far in advance as possible, keep his superiors advised, appraise each fire, take immediate vigorous action on potentially dangerous fires, and use his best ingenuity in securing control of the low-danger fires with conservative use of his experienced men. He should remain calm and lend his best judgment to each decision made. He should systematically keep clear records of the action taken on each fire from which he can periodically check the follow-up action needed to bring each to an orderly conclusion and insure that each crew sent out will receive the assistance needed to do the job assigned.

Large Fire: The large fire is the continuation of a small fire which for some reason initial and follow-up action taken was inadequate to control according to plan. A large number of small fires that occur each year have large-fire potentialities. Usually the large fire is fought under the direction of a fire boss located on the fire, who with his organization determines the men, equipment, and supplies needed for suppression, as well as the time and place they should be delivered.

As soon as communication between a fire and the dispatcher's office is established, the dispatcher's job is to give the man in charge all possible assistance and supply the needs promptly and effectively when requested. He should use the fire suppression plan as fully as possible and be prepared to supply quickly all available men, tools, equipment, and transportation. This means keeping currently posted on the location and availability of all these resources. The dispatcher should maintain a clear chronological record of his actions on the fire (See additional information under "Records").

The dispatcher should check his reference material and make available to the fire boss the best maps and information to be had. If the fire is in an area of special hazard for which a fire control plan has been made, the plan with the latest information should be furnished (See Fire Control Handbook, Part II, Chapter 3). He should secure progress reports on the fire from the lookouts and other reliable sources available and keep the supervisor's office informed.

The dispatcher should not forget the balance of his district during the course of a large fire. Frequently his entire organization will be drawn out of position, with many of his most reliable men filling important jobs on the large fire. He should keep district protective positions filled with the best qualified men available and take more than usual precautions to prevent mistakes due to the emergency filling of positions. He should take prompt and aggressive action on any other fire that occurs and try to make doubly sure that none will develop into a second large fire. Extreme vigilance should be his watchwuntil the emergency has passed and he is again organized for normal action.

Checking "Out" Fires:

Experience has shown that the most economical practice is to have every fire checked by the district ranger, assistant ranger, or a fully qualified guard within twenty-four hours after it is reported as out by the crew suppressing it (See Fire Control Handbook, Part II, Chapter 9). This practice should be rigidly followed unless prevented by a more serious fire elsewhere or as otherwise permitted by the policy. In remote situations where checking is impractical, a competent guard should remain at the fire for twenty-four hours after the last spark is found unless otherwise instructed. This will guarantee complete extinguishment. Every fire handled by an inexperienced guard or a cooperator should be inspected as a safeguard. The dispatcher is usually responsible for seeing that all fires are checked out in accordance with the year established standards.

Records on Going Fires

The capacity of the dispatcher to handle a heavy fire load and correlate a great many details relating to numerous fires and crews without making numerous mistakes will depend largely upon the order-liness with which he organizes the job and the manner in which he mainer tains systematic records. Particularly in serious group-fire situations the details are so numerous that no man should attempt to remember them. The dispatcher should train himself in keeping clear and orderly records. This training should be continuous, and the same system should be used throughout the fire season so that it will become a fixed habit; otherwise, when a serious situation occurs, there will be delay in starting the record, with no opportunity to catch up after the situation develops.

Chronological Record:

On Small Fires: The dispatcher should record for each fire on the front of Form 2-R6 the name of the person in charge of the initial attack crew, the number of men accompanying him, the place from which he left, and the kind of transportation used. All pertinent subsequent actions, as reports on the progress of the fire and reinforcements sent, should be recorded by date, time, and names of principal persons involved,

On the back of the Form 2-R6 or additional sheets attached thereto as required. If properly done, this will maintain in one place a chronological history of each fire from the standpoint of the dispatcher. It will make possible proper follow-up on each, and will prevent errors and mistakes due to forgetfulness. It will tell the story to a relief dispatcher or other concerned.

On Large Fires: The dispatcher should maintain a complete record of his action on large fires. This is a continuation of the record kept while the fire is small. All entries should be made by date, hour, and the names of the persons involved. Each order of men, equipment, or supplies should be recorded, with the name of the person in charge or by whom sent, and the location and name of the person to whom it was sent.

Load Lists, fire fighters' contracts, messages, and other important records should be promptly sent to the proper officer on the fire, a copy, if necessary, being systematically filed at the dispatcher's office and an entry made in the chronological record for each transmittal. Specific, clearly worded, and usually written, directions should be given each truck driver or others sent to the fire by the dispatcher. Such directions should name a specific person to whom to report.

An accurate chronological record is extremely important when a relief dispatcher is required. Such a record, together with properly filed copies of load lists and other pertinent data, makes it possible to check on all shipments from the dispatcher to the fire. This will be of primary importance to the dispatcher in effecting the reorganization of his forces at the conclusion of the fire and in making out the Form 929 fire report.

Aids to Keeping Posted on Fires:

The dispatcher needs a systematic method of maintaining constant touch with the status of going fires which will readily present a comprehensive picture of the situation. This is particularly important in keeping posted on the current status of numerous going fires during serious groupfire situations. Two methods are commonly used.

<u>Wall Map</u>: The dispatcher should maintain a fireman's or other suitable map, mounted on some soft wall-board material attached to the wall, for the purpose of showing the location, size, and status of fires occurring *within the protective unit. The accepted method is to place a $\frac{1}{2}$ " yellow *flat-headed tack, marked with the fire number as shown on the Form 2-R6 for the fire, at the plotted fire location on the map. Normally this is done as soon as action has been taken on the fire and signifies the existence of a going fire at that location. As soon as the fire is out, the flat-headed tack is replaced by a small, colored, round-headed tack which by color legend designates the final size class of the fire.

When properly posted, the wall map currently displays the number, location, and size class of all fires that have been put out within the unit for the season and shows the number and location of going fires.

R-6 F. C. Hdbk. *Revised 9-20-50 No. 61 The general fire picture can be seen at a glance, and by referring to the Form 2-R6 corresponding to the number shown on the flat-headed tack representing any going fire, detailed information on that particular fire can be had. When fires occur singly, this record is all that is needed, but when a serious group fire situation occurs, there is need for additional means of keeping in touch with the situation.

Three—Basket System: When numerous, fires occur in rapid succession, the dispatcher should follow an orderly method of handling the Forms 2-R6 to eliminate the possibility of overlooking some fire, to save valuable time, and to insure that the needs of each fire and each crew will be given due consideration periodically without fail. When properly used, the three-basket system fills this need. Any convenient three-compartment file may be used, and the compartments should be labeled so as to segregate the Forms 2-R6 into the following classes: (1) New reports, (2) reports on fires on which action has been taken, and (3) reports on fires that are reported out but need to be checked.

Forms 2-R6 for fires on which action has not been taken are placed in the first compartment, and are constant reminders of fires on which action is yet to be taken.

As soon as the dispatcher has taken adequate initial action, which has been recorded on the back of Form 2-R6, the form is placed in the second compartment. The Forms 2-R6 in the second compartment are constant reminders that the fires they represent are still going and may require additional attention. Periodically, the dispatcher should go through this group, reappraising each fire individually in the light of any new information he has obtained and recording pertinent facts, decisions, or actions taken. This procedure saves time by confining the dispatcher's attention to the active fires and insures proper consideration to each.

As soon as a fire is reported out and ready to be checked, the dispatcher should enter the pertinent data on the record and transfer the Form 2-R6 to the third compartment where it will serve as a constant reminder that the fire must be checked as out, according to established standards. As soon as the fire has been checked and reported out, the dispatcher should make an appropriate entry on the Form 2-R6 and remove it from the third compartment.

Form 929 Fire Report:

The dispatcher usually makes the Form 929 fire report. It should be made as soon as possible after the fire is out. It should reflect the true *conditions and be made accurately in accordance with instructions in the Manual, NF-A, R-6 1101.3. For convenience a separate set of instructions may be bound and kept on the dispatcher's desk. The dispatcher should see that the smokechaser or other person responsible for suppressing the fire gives the information called for by the instructions on Form R6-F26. *

Other References:

* FF financial policy - Manual, GA-F, 305. * Hiring equipment - III-4, F. C. Hdbk. Hiring fire fighters - III-4, F. C. Hdbk.

R-6 F. C. Hdbk.

*Revised 9-20-50 No. 61

DISPATCHING CHECK LIST

Single Fire

1. Take Lookout's Report

2. Get Cross Shots

(a) Call the lookout who best sees the area where the fire is reported.

(b) If possible get a cross shot that will be near to right angles with the original shot. This permits greater accuracy in platting.

3. Plat Fire

Plat lookout readings accurately.

4. Dispatch Men and Crews

- (a) Send man closest in travel time.
- (b) Give smokechaser detailed information as to:
 - (1) Location of fire.
 - (2) Route of travel (compass course from known point).
 - (3) Men to pick up enroute.
 - (4) Probable action to be taken on fire.
 - (5) Follow-up action that may be expected.
 - (6) When to report back.
- (c) Make sure smokechaser has fire <u>marked</u> on his map and above information written down.
- (d) Re-man important planned stations as soon as possible after they are vacated.
- (e) Place numbered map tack in wall map.
- (f) Notify supervisor's office of fire if required.

5. Follow-up Action

- (a) Check with lookouts as to probable condition of fire.
- (b) Have reserve forces and equipment lined up for quick action if needed.
- (c) Send additional men and equipment as required to control fire within established standards.

Group Fires

1. Anticipate Conditions in Advance

- (a) Weather bureau forecasts and fire-danger rating.
- (b) Lookout's reports on cloud formations and reports from adjacent areas.
- (c) Burning conditions.

2. Check Organization

(a) Check strength-of-force plan.

(b) Inform guards, crews, cooperators.

*(c) Inform other district rangers' and the supervisor's offices of progress of lightning storms.

(d) If storm has broken over a certain area, move in smokechasers and hold at point of communication for faster dispatching.

3. Check Communication

- (a) Test all phone lines and stations.
- (b) Check radio stations.

4. Re-check Dispatching Setup

- (a) Assembling reports numbered ahead.
- (b) 3 baskets:
 - (1) New reports
 - (2) Action taken
 - (3) Fires out; yet to check
- (c) Platting materials ready--pencils, ruler, platting protractor, fireman's protractor.
- (d) Provide help for dispatcher.
- (e) Provide relief at key points.

5. Take Lookout Reports

6. Get Cross Shots

- (a) Call the lookout who best sees the area where the fire is reported.
- (b) If possible get a cross shot that approaches a right angle with the original shot.
- (c) Keep all reports of the same fire on one summary if possible. Otherwise, clip together all reports on the same fire.

7. Plat Fire

- (a) In overloads have assistant plat readings.
- (b) Mark the fire on the platting map.

8. Send Men and Crews

- (a) Send man closest in travel time.
- (b) Give smokechaser detailed information as to:

FIRE CONTROL HANDBOOK REGION 6



PART II
PREPAREDNESS

CHAPTER 8

SMOKECHASING

FIRE CONTROL HANDBOOK

REGION 6

PART II

PREPAREDNESS

Chapter 8

SMOKECHASING

SMOKECHASING

Table of Contents

Table of Contents - (Contid.)

	Page No.
Mileposts and Signs	II-8-20
Orient Map	II-8-20
With Compass	II-8-20
By Landmarks	II - 8-20
Pacing	
Natural Pace	II-8-21
Pacing By Chains or Tallies	11-8-21
How to Tally	II-8-22
Horizontal Distance	II-8-22
Correction for Slope	II-8-22
Practice	II-8-23
*-Pace-Length Stick Method	II-8-23-
Care of Smokechaser Outfit	II-8-23
Equipment for Special Men	II-8-25
Transportation	II - 8-25
Continuous Travel	II-8-25
Record Information for Finding Fire	II-8-26
Record Data on Lookout Form	II-8-26
Locate Fire on Map	II-8-27
Panoramic Photograph	II-8-28
Plan Route of Travel	II - 8-28
Methods of Finding Fires	II-8-28
Determine Azimuth and Distance from Known Point	II-8-28
Get on Lookout's Line of Sight	II-8-29
Correlate Map and Ground Location	II-8-30
Gridiron for Fire	II-8-31
Plot and Use 2-Point Intersection	II-8-32
Variations of 2-Point Intersection	II-8-33
Offset Method	II-8-34
Variation of Offset Method	II-8-35
Arrange and Use Direction Signals with Lookout	II-8-36
Supplemental Methods	II-8-36
Mark point of Departure from Road or Trail	II-8-36

SMOKECHASING

Introduction

Smokechasing is the job of finding fires. It starts when the report is received and ends when the fire is found.

Objectives, policies, and methods of fighting fire are described in Part III, Chapter 1 (Fire Fighting) and Part II, Chapter 9 (General Instructions for Fire Guards) of the R-6 Fire Control Handbook. These chapters should be the smokechaser's source of printed information on fire fighting, and he should supplement them by experience. Make every fire a lesson.

Prompt Action

Fires must be found quickly to attain suppression objectives. Immediate action must be taken on every discovered fire. Minutes count.

The smokechaser will usually receive instructions from the dispatcher or ranger, but *** may receive reports from lookouts or others. If the smokechaser cannot communicate with the dispatcher or ranger within a reasonable time, he should act on his own judgment.

Many fires are difficult to find, particularly lightning fires which *** often occur in the most inaccessible country. It is essential that the smokechaser not only make use of his woodsmanship, but of the compass, map and protractor, field markings, pacing, and information given him by the dispatcher, plus all of his ingenuity and resourcefulness. His is a fight against time, for time is aiding the fire to get a good start. Head work frequently saves foot work and time.

Compass and Protractor

The compass is an invaluable aid to the smokechaser. *** It provides one of the most accurate methods of finding fires, especially those fires which are smoldering but not sending up enough smoke to be readily seen (sleeper fires). The compass enables the smokechaser:

(1) To keep oriented in the woods.

(2) To run straight lines through rough country.

(3) To locate fires.
(4) To orient his map.

It may be used:

(1) As a protractor to plat fire location in the field.

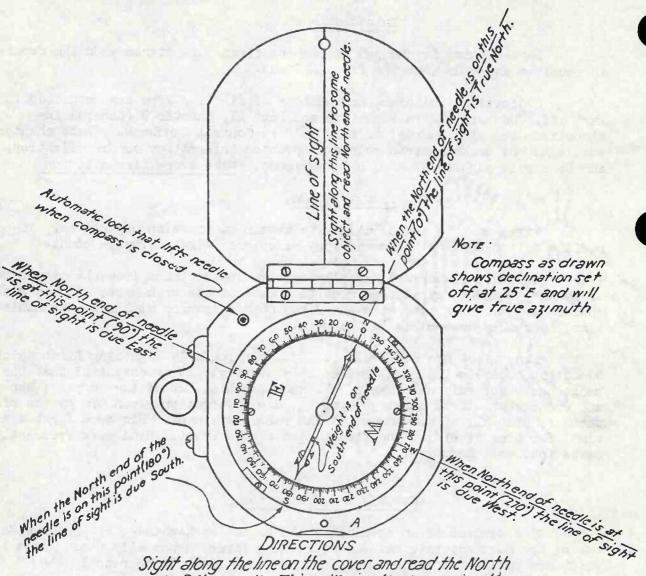
(2) To follow or retrace land survey lines.

(3) To run closed traverses from which areas can be calculated,

The Azimuth Compass

The Azimuth compass is standard and each smokechaser should be equipped with one. Figure 1 is a diagram of the azimuth box compass.

INSTRUCTIONS FOR USE OF AZIMUTH BOX POCKET COMPASS



Sight along the line on the cover and read the North end of the needle. This will give the true azimuth when the declination has been set off as shown above.

Hold edge A of the compass next to you while sighting.
Move your feet, not your body to get correct course
and stay behind your compass

Always read North end of needle Let the needle settle first before reading. Read figures in proper progression.

To obtain a backsight or reverse reading:
If the foresight is 180° or less, add 180°

If the forsight is more than 180°, subtract 180°.

Example:-IForesight Azimuth 23°= 180°+23°= 203°, which is backsight reading

Fig. 1

Magnetic Declination: The ends of the needle are attracted by forces acting at two nearly diametrically opposite points of the earth, called the magnetic poles. The one near the north pole is called the north magnetic pole, and lies adjacent to the true or geographical north pole of the earth. The north magnetic pole attracts the end of the needle marked with an arrow. In Oregon and Washington the north magnetic pole lies to the east of the true north pole. The angle of difference between true north and the magnetic north is known as the "Magnetic Declination."

It is necessary that the azimuth compass sights point to true north when the magnetic needle points to zero. This is accomplished by setting off the zero of the azimuth circle to the right of the line of sight a number of degrees equal to the "Magnetic Declination." The magnetic declination varies from 22° in southern Oregon to 25° in northern Washington. The ranger will see that the declination is properly set off.

North End of Needle: The compass needle is magnetized and the marked end always points to magnetic north. This is the end of the needle which always should be read. On some compasses the north end is black, the south white; on others both ends are the same color. The needle is usually marked as shown in Figure 2.

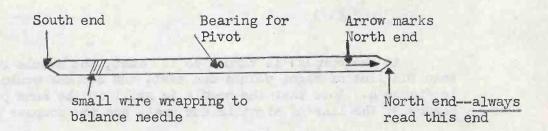
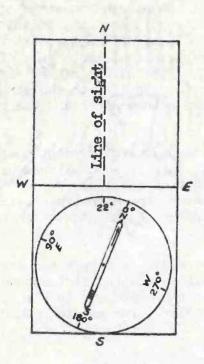


Fig. 2

Azimuth Circle: There are 360° in the azimuth circle. Either 0° or 360° is true north. There are 60 minutes (written 60°) in each degree, 30° to each half degree. Thus, $1^{\circ} = 60^{\circ}$, $\frac{1}{2}^{\circ} = 30^{\circ}$. The azimuth compass can be read accurately only to degrees and half degrees. Since the lookout uses degrees and minutes in his readings, it is necessary that the smokechaser be able to convert minutes to degrees and half degrees for use with his compass. Minutes should be converted to the next nearest whole or half degree.

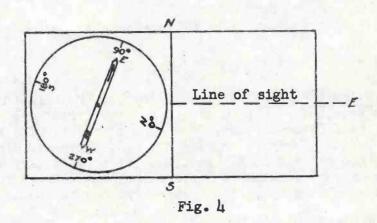
Why E (90°) and W (270°) are Reversed: The needle stands still, pointing to north, while the dial and line of sight revolved around it. Thus, as the sight and dial swing east, or right, the needle indicates a reading to the left of zero. For convenience in reading, and in order that the north end of the needle may be read direct, the E and W markings on the dial are reversed and the figures progress to the left. This is illustrated in Figures 3 and 4.



In Figure 3 the compass is sighted to true north. The declination is set off at 22°, the needle points to magnetic north and the line of sight is true north. The reading, from north end of needle, is 0°.

Fig. 3

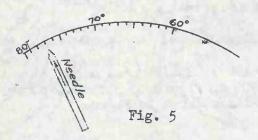
As the compass is turned to the east, the needle remains stationary. When the line of sight points due east, the compass would appear as shown in Figure 4. Note that the needle is still in the same position as in Figure 3; the line of sight is due east, and the compass reading is 90°.



Use of Compass

Iron or steel near the compass deflects the needle. Care should be taken to keep axe, shovel, ***, pocket knife, or similar objects at a sufficient distance from the compass to prevent their deflecting the needle. It may be necessary to stay at least fifty feet from an automobile or wire fence.

Read Compass: When the compass is sighted and needle settles, read the graduation to which the marked end of the needle points. The reading shown in Figure 5 is azimuth 77°. If read carelessly, or not according to proper progression of figures, it might be recorded erroneously as 83°. Always progress from smaller to larger figures.



Run Compass Course: The method used to run a compass course will depend on the length of shots which can be made.

Short Shots: To run a compass course through timber, where each shot will average 200 yards or less, the compass should be held in the cupped palms of the hands, elbows pressed against body, compass 12" to 18" below level of eyes, heels together, and body swinging on heels to align sight without change of posture. Care should be taken to hold the compass level and to have the needle swinging freely on the pivot.

When north end of needle points to azimuth of course to be run, look ahead along the white line on inside of compass lid and pick out tree, rock, snag, or other object in line of sight. Now glance quickly at the compass to make sure reading is correct. Again glance ahead to the object sighted to make sure it is on the line of sight. Repeat process until line of sight and object are definitely established. Keeping your eyes fixed on the object selected, close the compass, pace forward to object, and take next sight.

Long Shots: For shots over 200 yards, the compass *** should be placed on a Jacob staff (cut a small pole, stick it in the ground, and attach compass to pole). Do not set on bare rock, for if mineralized it may deflect the needle. Set compass above the ground whenever possible. Level the compass, allowing needle to float freely on the pivot.

When the needle settles, revolve compass slowly until correct reading is obtained. Again allow needle to settle, making sure that compass is level. When correct azimuth is obtained, place eye at small pointer, which also serves as lock for compass lid, and look along white line of sight. Pick out object as previously described and pace to it. Repeat the process for next shot.

Determine Azimuth to Object: To determine the azimuth to an object such as a tree, rock, lookout station, or mountain peak, line the object with the compass sights. After alignment is made and needle settle, read

the compass. If the object is near by, the compass should be held as described under "Short Shots." If the object is distant, use the compass as described under "Long Shots."

Turn 90° Angles: In running a compass course, the smokechaser frequently has occasion to make 90° turns to the right or left.

To turn a 90° angle to the right from a given reading, add 90° to the reading; to the left, subtract 90° from the reading.

Situation: Given a reading of 900; turn a 900 angle to the right.

Procedure: $90^{\circ} + 90^{\circ} = 180^{\circ}$. See figures 6 and 7.

Reading of 900 in Figure 6. Compass turned 900 to the

right to position shown in Figure 7.

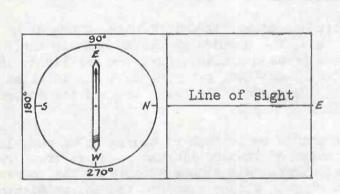


Fig. 6

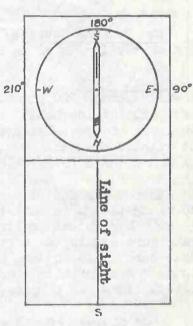


Fig. 7

Situation: Smokechaser is running compass course on azimuth 187°. He encounters unforeseen obstacle, such as steep rock slide or precipitous wall. Unable to climb over, he must go around.

Procedure: Travel to his right looks easiest. He turns a 90° angle to the right and paces on course 277° (187° + 90°) until it is possible to get by obstacle. He then paces on course 187° (which is 90° angle to the left and parallel to his original course) until he is past the obstacle. He then turns a 90° angle to the left and paces on course 97° (187° - 90°) the same distance he paced on course 277°. This places him on his original course and he is ready to proceed on azimuth 187°.

If it is necessary to turn a 90° angle through 0°, the following method can be used:

> To the right: Add 90° to the reading and subtract 360° from that sum.

> Situation: Given a reading of 285°. To turn a 90° angle to the right.

Procedure: $285^{\circ} + 90^{\circ} = 375^{\circ}$ $375^{\circ} - 360^{\circ} = 15^{\circ}$, the azimuth sought.

To the left: Add 360° to the reading and subtract 90° from that sum.

Situation: Given a reading of 15°. To turn a 90° angle to the left.

Procedure: $15^{\circ} + 360^{\circ} = 375^{\circ}$ $375^{\circ} - 90^{\circ} = 285^{\circ}$, the azimuth sought.

With a little practice the 90° angle, either to the right or left, can be read directly from the compass. Smokechasers should practice turning 900 angles until they can do so quickly and accurately direct from the compass without involving computations.

Foresights and Backsights: A foresight is a sight ahead taken in the normal practice of running a compass course. The backsight is a sight taken in exactly the opposite direction to the foresight,

The smokechaser should know how to convert a foresight to a backsight, or vice versa. In searching for a fire which a lookout has discovered, the smokechaser often has to place himself on the lookout's line of sight by backsighting to the lookout.

To convert a foresight to a backsight: If the foresight is less than 180°, add 180° to it; if foresight is more than 180°, subtract 180° from it.

> Smokechaser has azimuth 2120 as lookout's line of sight to a fire. He wants to know what his compass reading to lookout will be when he gets on lookout's line of sight.

Procedure: $242^{\circ} - 180^{\circ} = 62^{\circ}$, his reading to lookout.

In the above situation, if the lookout's line of sight was azimuth 62° , the smokechaser's compass should read $62^{\circ} + 180^{\circ} = 242^{\circ}$.

Local Attraction

The compass needle is sometimes deflected by the attracting force of metal deposits in the ground. It can be recognized by checking each foresight with a backsight.

Smokechaser takes a foresight from "A" to "B", azimuth 85° (see Figure 8). He paces to "B" and takes a backsight of 265° (85° + 180°). He finds he sights at "C" instead of "A". This indicates local attraction. It may be caused by a metal object near the compass. Check for this first.

Compass courses run through a country of local attraction are inaccurate. The following method should be used to remedy this situation: Find a point on the course where backsight shows no local attraction. Select two or more objects (snags, trees, or peaks) ahead in alignment with course to be run. Follow this alignment, by frequent sights on the objects, through the area of local attraction.

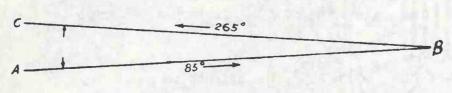


Fig. 8

The Protractor

The smokechaser's protractor is made of transparent material and has the azimuth circle, graduated in degrees and half degrees, printed on it. A black string is suspended from a small hole in the center of the circle. E and W, and progression of figures are not reversed as on the smokechaser's compass.

Use of Protractor: The smokechaser can determine or draw azimuths from a point, or between any two points, on his map with his protractor.

Situation: Lookout "A" gives reading on a fire of 1720. Smokechaser wishes to draw this line of sight on his map.

Procedure:

- (1) Place map on flat surface.
- (2) Center protractor over "A".
- (3) Turn protractor until N side points to top of map and 00 and 1800 graduations coincide with, or parallel, a meridian or township line.
- (4) Hold protractor tight and draw string taut to intersect azimuth 1720.
- (5) Extended string represents line of sight. It can be drawn using side of protractor as straightedge.

Smokechaser wishes to determine azimuth from "A" Situation: to "B" on his map.

First three steps as in above procedure. Procedure:

(4) Hold protractor tight and draw string taut over "B"

(5) Read azimuth where string intersects graduated circle

There are various applications of the two situations described above. The smokechaser should practice with the protractor until he becomes proficient in its use. He will find it a great aid in solving smokechasing problems.

For Checking Vertical Angle: Many times the smokechaser has had a backsight to the lookout but has been unable to judge whether he was too high or too low on the mountain, particularly when there were no outstanding landmarks by which to place himself.

The celluloid protractor will give the angle of elevation by sighting along one edge and letting the string, with a weight attached to it, act as the plumb line. This weighted string can be held in place by a finger after the line has steadied itself and will give the angle reading directly if the smaller azimuth numbers are turned toward the observer on plus readings and away from the observer on minus readings.

For Gridiron Contouring: In rough and hazardous areas where gridironing up and down the mountain parallel to the line of sight would be slow and dangerous, the gridironing could be carried out by contours, parallel to the vertical angle intersection.

Even in a high fog when the lookout cannot be sighted, the protractor can be used for determining the elevation, if any point of known elevation can be located. Thus by using the lookout's vertical angle to figure the elevation of the fire and by computing his elevation by tangent offset on a vertical plane, the area of search would be greatly limited.

Use Compass as Protractor: Smokechaser wishes to draw on his map an azimuth line of 850 from Rock Point (see Figure 9).

- (1) Orient map to north as described under "Orient Map."
- (2) Place one edge of compass against Rock Point and revolve compass until it reads 85°.
- (3) Draw line along edge of compass from Rock Point in the direction of line of sight. Care should be taken to keep edge of compass next to the center of Rock Point and let needle settle before drawing the line.

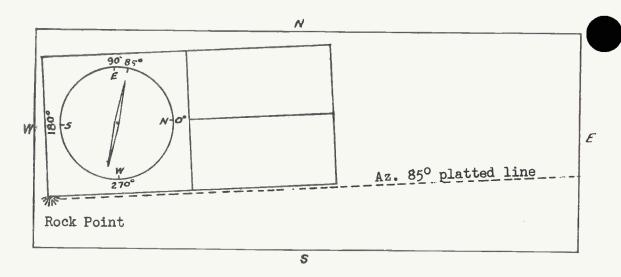


Fig. 9

Maps and Surveys

Maps are important in Forest Service work. Three types - base map, topographic map, and fireman's map - are the most common.

The base map is usually a black-line print of the entire national forest on either $\frac{1}{4}$ " or $\frac{1}{2}$ " scale. It shows township, range, and section lines; standard parallel and meridian lines if present; county and national forest boundaries; natural features (mountains, lakes, and streams); and roads, trails, telephone lines, towns, ranger stations, and similar cultural features.

The topographic map (U.S.G.S. Quadrangle) is usually a brown-line print of about twenty-four townships with a scale of approximately $\frac{1}{2}$ ". It shows topography in contour intervals of 100 feet. In addition, it shows township, range, and section lines; standard parallel and meridian lines if present; county boundaries; natural features; and a few cultural features, such as roads and trails.

The fireman's map, a blue-line print on $\frac{1}{2}$ " scale, is a map of the individual ranger district and contains the information shown on the base map

In addition, it shows the location of planned protection stations and the boundaries of the protection unit. The top of the map is north. The lettering is so placed that the map can be read easily with the top or north side away from the body.

The smokechaser will use the fireman's map. He should study it and visualize it as a graphic representation of the country. His ability to locate fires quickly will often depend upon his skill in reading and interpreting the map.

-Legend

Each symbol on a map has a definite meaning. The most common symbols are described as follows: N. F. Boundary Supervisor's Headquarters Adjacent N.F. Boundary District Ranger Station Guard Station County Line Roads, Good Permanent Lookout Station Emergency Lookout ======= Roads, Poor (1) Station Trails Triangulation Station Railroad Improved Recreational Area Flume House, Cabin, or Other Building Telephone Line Wet Meadow or Bottom Grassland Telephone Line Along Section Line Marker Roads BM Bench Mark-* Telephone Line Along 463 Trails



F. S. Monument

Large Town or City

Mountain Peak



Cliffs

Slide Rock or Rock Flats



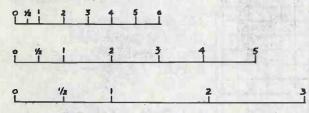
Small Town or Village Ridge



Special legends are sometimes used for features not included in the foregoing list. The smokechaser should learn the legend which applies to his map.

Scale

The scale of a map is the relative proportion which a given horizontal distance on the map bears to that same distance on the ground. Thus, a scale of $\frac{1}{4}$ inch to the mile means that $\frac{1}{4}$ inch in horizontal distance on the map equals 1 mile in horizontal distance on the ground. Scales are represented as follows:



This is a scale of $\frac{1}{4}$ inch to the mile.

This is a scale of \(\frac{1}{2} \) inch to the mile.

This is a scale of 1 inch to the mile.

All distances are measured horizontally (see Figure 10).

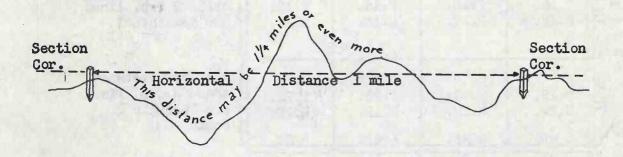
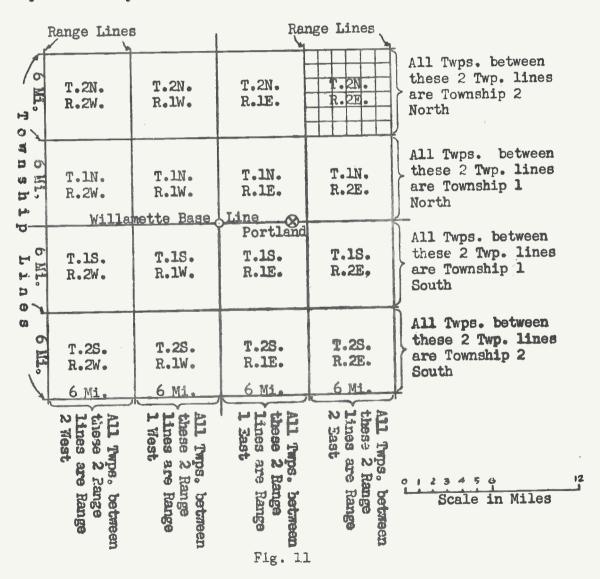


Fig. 10

Land Surveys

The lands in the western states have been subdivided in the public land surveys following a definite pattern. First, an initial starting point was selected which, for the States of Oregon and Washington, is located a short distance west of the city of Portland. A true north and south line was surveyed through this point, which became the principal meridian to which all other north and south lines are referred. This is known as the Willamette Meridian. At approximately six-mile intervals on either side, secondary north and south lines were surveyed parallel to the principal meridian known as Range lines. The six-mile wide areas between Range lines are known as Ranges and are designated 1, 2, 3, etc., East or West (of the principal meridian).

A true east and west line was surveyed through the initial point which became the principal base line to which all other east and west lines are referred. This is known as the <u>Willamette Base Line</u>. At approximately sixmile intervals on either side, secondary east and west lines were surveyed parallel to the principal Base Line and are known as <u>Township</u> lines. The sixmile wide areas between these lines are known as <u>Townships</u> and are designated 1, 2, 3, etc., North or South (of base line). The township and range lines divide the area into squares approximately six miles on a side (see Figure 11). The area within each of these sixmile squares is also known as a Township. Township and range lines on the usual map are comparatively heavy and easy to identify.



Townships: A full township is subdivided into 35 sections, each of which is approximately one mile on a side. The method of numbering is shown in Figure 12. Section numbers do not appear on the usual forest map but section lines appear in one of two ways: (1) as a thin solid line in county which has been surveyed, and (2) as a thin broken line in country which has not been surveyed. A broken line is also used to distinguish between surveyed and unsurveyed township and range lines. In addition to the above there are lines of latitude and lines of longitude which appear on the usual forest base map. They are continuous thin solid lines running entirely across the map east and west and north and south, respectively. Latitude/lines designate the degrees and minutes north of the Equator. Longitude dines designate the position west of Greenwich, England. They are very similar in size to the section lines and sometimes extreme care is necessary to distinguish them from section lines (see Figure 12). They can be distinguished best by observing whether or not they continue as straight lines completely across the map. Also, they seldom coincide with either section or township lines.

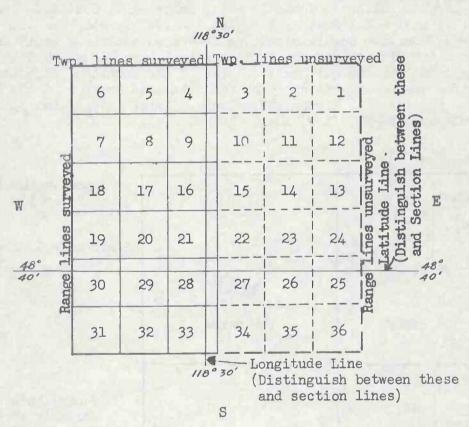


Fig. 12

Irregular Townships: Townships having fewer than 36 sections frequently occur. This may be due to error in early-day surveys, to large bodies of water, to joining of two surveys for which separate sets of base lines and meridian lines were used, or to other causes. Such townships may be from one to five sections wide either north and south or east and west. The numbering of the sections in them is governed by the control lines for the survey; that is, if the east and south lines were the control, numbering would start with Section 36 in the southeast corner and proceed north and west, using the usual numbers and placing the discrepancies in the north and west tiers of sections.

Numbering of sections might start in any corner of the township, so there is no fixed rule for determining the correct numbering other than to check the official General Land Office township plats. To avoid errors in reading, all townships with fewer than 36 sections should be correctly numbered on the smokechaser's map.

Due to correction made for convergence of meridian lines or errors in surveying, some townships with the normal number of sections cover more or less than 36 square miles of area, resulting in one or two outside tiers of sections being oversize or undersize. In this region these are usually the north and west tiers of sections.

Section Subdivisions: Each section is subdivided as shown in Figure 13. Each 40-acre tract can be accurately described with reference to the General Land Office survey by giving the township, range, section, subdivisions of the section, and control meridian. For convenience, standard abbreviations are used as follows: Township - T.; Range - R.; Section - Sec. (or S.); North - N.; East - E.; South - S.; West - W.; Willamette Meridian - W.M.; and Quarter $-\frac{1}{4}$. Section subdivisions are described according to their position in the section with reference to the cardinal directions; that is, NE $\frac{1}{4}$ is that specific 40-acre tract occupying the northeast quarter of the section. Likewise, NE $\frac{1}{4}$ SW $\frac{1}{4}$ is that specific 40-acre tract occupying the northeast quarter of the southwest quarter of the section (see Figure 13). Thus, a legal description will be written as follows: NE $\frac{1}{4}$ SW $\frac{1}{4}$, Sec. 10; T. 40 N., R. 35 E., W.M.

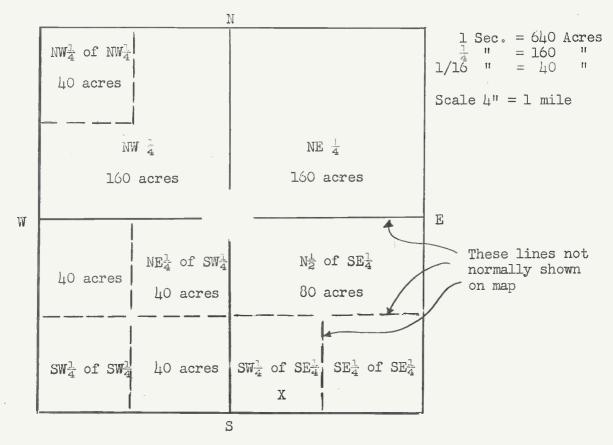


Fig. 13

- Suggestion: (1) Township and range lines on smokechaser's maps can be traced with a different color ink or made heavier so they can be readily distinguished from other lines on the map. This procedure may serve as an aid to the smokechaser and prevent errors in reading the wrong township, range, or section.
 - (2) As a further aid to the smokechaser in reading the proper section and subdivision, a sample township may be laid out on his map in which the correct section numbering of a standard township is shown with one section properly subdivided into forties.

Field Markings

It is necessary for the smokechaser to know how to find and interpret field markings. Study of the following illustrations will help him to become familiar with common ones.

Section Line Blazes: Section lines are designated by blazes or hacks on trees. Due to sparsity of trees in some localities it may have been necessary to blaze some standing as far as 33 feet on either side of the line. Trees standing on line were blazed on directly opposite sides of the trees where the line intersects it (see Figure 14(a)). As trees were selected farther from the line, the blazes were placed closer together on the side facing the line. Thus, trees close to the line will have blazes almost opposite each other, while trees approaching 33 feet from the line will have blazes side by side (see Figure 14(b) and (c)). (Some survey parties placed two hacks, one above the other, on opposite sides of trees standing directly on line.)

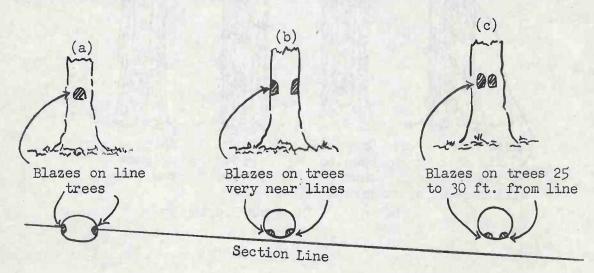


Fig. 14

Section Corners and Quarter $(\frac{1}{4})$ Corners: Several methods are used to mark section and $\frac{1}{4}$ corners. Frequently either a rock, a pile of rock, or a wood post is found, but recent surveyors have used an iron pipe with brass head (see Figure 15).

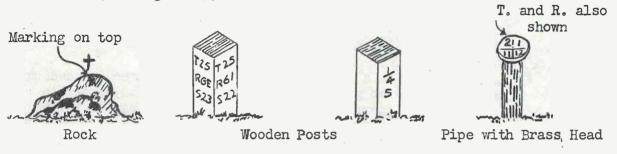
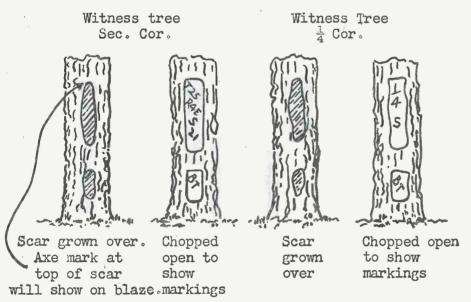


Fig. 15

Witness Trees: Where sufficient trees were available, section corners were referenced by four, and 4 corners by two, witness trees. They were scribed as shown in Figure 16. A small blaze scribed with "BT" (Bearing tree) was placed approximately 18" from the ground and above that a long blaze was scribed with the description of the corner. Where blazes have grown over, care should be used in chopping them open to prevent destruction of the scribing.



BT means Bearing Tree

Fig. 16

Location at Section Corners: A bearing is scribed with the section number corresponding to the section in which the tree is located. Blazes face the corner (see Figure 17).

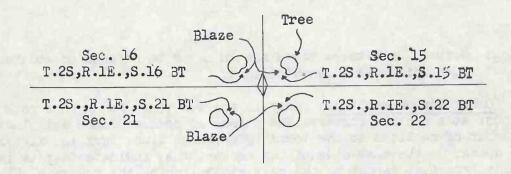
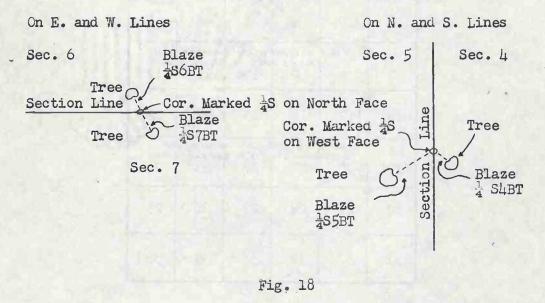
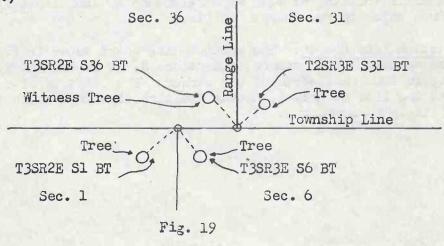


Fig. 17

Location at Quarter (4) Corners: See Figure 18.



Location at Jogged Township Corners: Jogged township corners sometimes occur for reasons described under "Irregular Townships." Two corners had to be established instead of one. Two witness trees were used to describe each corner. Each such tree found will be in the township, range, and section that are marked on it. Blazes face the corner. (See Fig. 19.)



II-8-17

Caution: Corners or witness trees should never be defaced or obliterated.

Such action is a law violation.

Other Corner Markings: Notches are sometimes found on a rock or wood post at a section corner. The number of notches found will indicate the number of sections to the township or range line; that is, if four marks appear on the east side of the marker, they indicate that it is four sections from that corner to the east range line of the township. The number of notches on the south side of the marker indicates the number of sections to the south township line of the township (see Figure 20).

			1		
6	5	4	3	2	1
7	Notes	tions e	licate 1	umber Range lii 11	ne.
18	17	16	15	14	13
19	Note secti 20	hes indo	licate n uth to k 22	umber wnship 23	line. 24
30	29	28	27	26	25
31	32	33	34	35	36

Fig. 20

Section Line Crossing Markers

Section line crossings on a road or trail frequently are marked by section line boards, cruiser's tags, or crosses. They are important to the smokechaser in locating himself with reference to land lines and as starting points from which to run courses to fires.

Section Line Boards: The section line board shown in Figure 21 indicates the section corner common to Sections 2, 3, 10 and 11, T. 40 N., R. 30 E., W.M., is 2000 feet north of the marker. The board is placed at right angles to the line of travel, facing the direction from which smokechaser is most likely to approach.



Fig. 21

Cruiser's Tags: These markers usually are metal, with black lines on a yellow background. Township and range numbers are scratched on the tag when it is posted. The smokechaser may find two types of cruiser's tags. The most common type is shown in Figure 22. It indicates the corner common to Sections 1, 2, 11 and 12, T. 40 N., R. 30 E., W.M., is approximately 20 chains (1320 feet or $\frac{1}{4}$ mile) north of the tag.

-In recent years aluminum tags similar to that shown in Figure 22 have been used. 4x6-inch aluminum section corner posters also provide location information for use of smokechasers.-

				ster			
VIII.		40.11		30		10.5	
6	5	4	3	2	1	-	Position
7	8	9	10	11	12		
18	17	16	15	14	13		
19	20	21	22	23	24		
30	29	28	27	26	25		
31	32	33	34	35	36		

Fig. 22

The other type used by Forest Service cruising parties represents a single section instead of a full township. Subdivisions of the section are shown, and the tack indicates position of the tag with respect to the corner. The smokechaser should be sure of the type of tag he is reading to avoid possible error.

indicated

Crosses: A cross (X) cut into a tree along a road or trail usually indicates a section line crossing. Before the smokechaser can be sure of this, he must find additional evidence, such as a series of line blazes running in a cardinal direction leading away from the tree.

Horizontal bars may be cut in the tree below the cross, each bar indicating a distance of 5 chains (330 feet) to the section corner. Sometimes a blaze about 6" long is placed on the side of the tree facing in the direction of the corner.

Mileposts and Signs

Mileposts or signs along roads or trails are valuable aids in finding fires. A milepost along a road indicates the distance from the post to a main highway, town, or other prominent starting place. The posts are usually white, about three feet high, and have a black number on each face near the top. A mile sign on a trail indicates the distance from the sign to a road, guard station, or other starting place. ***

Orient Map

Frequently the smokechaser has occasion to orient his map in the field. This can be accomplished either with the compass or by use of visible landmarks.

With Compass: Place the compass on map so one side of compass coincides with a meridian or range line. Revolve map and compass together, being careful not to disturb position of compass on map, until the needle points to zero. The map will then be oriented.

By Landmarks: If the smokechaser is sure of his field position, he need know only one topographic feature to orient his map (see Figure 23). Knowing he is at Moss Pass, the smokechaser aligns Moss Pass and Rock Butte on his map with the actual points by sighting across his map. If the smokechaser is not sure of his position, he needs two or more topographic features to orient the map. He sees that Snow Mountain and Rock Butte are in line. He also knows that he is somewhere on the top of Bald Ridge. He lays the map flat and aligns Snow Mountain and Rock Butte with these same features on his map. The map is then oriented because it is correlated with the topography. He next extends a straight line through Snow Mountain and Rock Butte on his map and finds this line intersects Bald Ridge at Moss Pass, which is his field position.

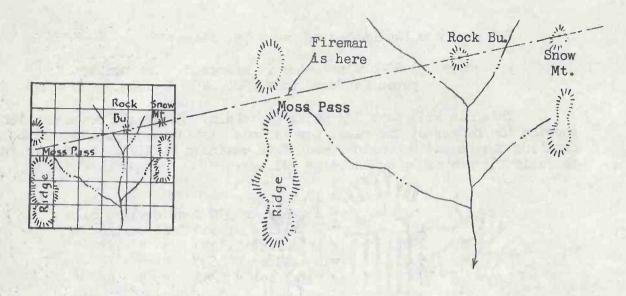


Fig. 23

Pacing

Pacing is the means by which smokechasers measure distance in traveling to a fire. The smokechaser can determine from his map the distance and direction to a fire from a landmark, section line marker, milepost, bridge, corner, or point on road or trail. Then, by running a compass course and pacing the distance, he should find the fire. Also, pacing may be used to measure the dimensions of a fire with which to determine its size. It is important for the smokechaser to be able to pace with reasonable accuracy.

Natural Pace

A pace, as used in the Forest Service, denotes two natural steps and usually is counted each time the right foot strikes the ground. When pacing, one should walk at a natural gait and not try to take a three-foot step.

To determine the length of your pace, measure a course on level ground through average cover conditions. Pace this course several times both ways at a natural gait. Count the average number of paces it takes to cover the course. Divide the length of the course by average number of paces taken. The result will be the length of your natural pace.

Procedure: A 200-foot course is measured. The number of paces = 36. 200 divided by 36 = 5.5 feet, the length of this man's natural pace.

Pacing by Chains or Tallies (Optional)

The "chain" (66 ft.) unit sometimes is used to compute areas and measure distance, such as length of control line around fires.

To determine the number of paces per chain:

Procedure: A 20-chain course is measured. The number of paces is found to = 250. 250 divided by $20 = 12\frac{1}{2}$.

This man will take $12\frac{1}{2}$ paces per chain. He should prepare a table showing the number of his paces for various distances. A common method of counting chains is to consider each five chains a "tally". (Refer to "How to Tally".) His table would be as follows:

 $12\frac{1}{2}$ paces = 1 chain $62\frac{1}{2}$ " = 1 tally or 330 feet or 1/16 mile 125 " = 2 tallies or 660 feet or 1/8 " 250 " = 4 tallies " 1320 " " 1/4 " 500 " = 8 tallies " 2640 " " 1/2 " 1000 " = 16 tallies " 5280 " " 1 "

How to Tally

Considering each five chains as a "tally", distance and area can easily be divided into convenient units as follows:

1	mile	DP40 1000	80	chains	or	16	tallies	80	chains	square	transis design	640	acre	s
$\frac{1}{2}$	11	-	40	11	11	8	II .	40	п	n	=	160	11	
1/4	11	0000	20	11	11	4	11	20	tt	11	=	40	11	
1/8	3 11	CHIECO	10	n —	tt.	2	11	5	TI.	n	=	2늘	. 11	
1/16	5 11	986	5	H	11	1	- 11	(10	square	chains	=	1~	11)

Paces can be counted by use of a pebble for each tally and a twig for each mile, or the smokechaser can score each tally in his notebook. It is essential to count paces accurately regardless of the method used.

Horizontal Distance

All distances shown on maps are horizontal distances. In traveling up and down slopes, one actually travels a greater distance than is shown on the map (see Figure 10). The slope of the ground, if it is considerable, affects the length of the step. The horizontal distance covered by each step is shortened whether one goes up or down hill. Similarly, rough bottomland or brush affect the length of step.

-Correction for Slope by Dropping Paces-*

The difference between horizontal distance and slope distance varies with the steepness of slope; the steeper the slope the greater the difference. On a steep slope the smokechaser may take two paces to cover a horizontal distance equal to one pace. For this reason he should learn to discount or drop a pace at regular intervals so his tally will be correct for horizontal distance. Practice and checking are essential to reach satisfactory performance. The following table has been compiled from actual tests. It should be used as a guide.

R-6 F.C. Hdbk. *Amended 2-25-53 No. 73

Per cent	(%)	:	Asc	en	ding	*	Des	scending		
Slope			Step		Skip	:	Step	:	Skip	
60		:	1	:	1	:	2	:	1	
30	777	:	2	:	1	:	6	:	1	
20	440	:	3	:	1	:	11	:	1	
10			.6	:	1	0	·	0	Cine Cine	

Practice

It requires practice to become efficient in pacing. Each smokechaser should practice often. Rough country along section lines or a measured course near the guard station serve as good courses. Practice on slopes and through brush until accurate corrections can be made for such conditions.

*-Pace-Length Stick Method

An inexperienced smokechaser, who has not had time to become proficient in the method described above, will attain greater accuracy in measuring horizontal distance in steep or very brushy country by use of the pace-length-stick method.

Cut a stick the length of your natural pace-one step or $\frac{1}{2}$ length of pace may be marked off on pulaski handle for measuring. Hold one end of stick against the body and the other end on ground in front of you. Make a mark on the ground and proceed to this mark. Repeat operation until top of hill is reached. Don't forget to count paces.-*

Care of Smokechaser Outfit

Every smokechaser is equipped with a standard smokechaser outfit. These outfits, within certain minimum standards, may vary somewhat to meet individual forest needs.

When the smokechaser receives his outfit at the beginning of the fire season, it is complete and each item is in good condition. It must be kept so throughout the entire season. This means:

(1) It will be used on fires only.

(2) After use it must be immediately restored to standard.

(3) It must be assembled and kept in the handiest place for quick getaway.

(4) Except for normal wear, it must be returned to the ranger, or stored for winter, in as good condition as when received.

The smokechaser should have an intimate knowledge of the care and use of his fire fighting equipment. He should take apart, inspect, and reassemble his outfit at frequent intervals. The following reminder list will help him keep the outfit in good condition:

(1) Keep compass in pack, away from tools (which demagnetize the needle), in a place where it can be obtained readily. Lid should be firmly closed to prevent wearing of needle on pivot. If lid will not remain closed, put a heavy rubber band around compass.

- (2) Map should be in map case. Map case should be either inside of a packsack pocket or attached to outside of pack.
- (3) Put a wood handle on file. This makes it easier and safer to use and prevents punching holes in pack. Wrap file in paper, preferably oiled.
 - (4) Replenish emergency rations after use.
 - (5) Replace first aid kit, or items therein, after use.
- (6) Protect knapsack or packboard against unnecessary wear. If knapsack or packboard is carried in car, see that sharp tools do not punch holes in it. Don't set it on damp or dirty surfaces.
- (7) Keep axe and other edged tools sharp and clean. Keep one blade of the axe for heavy chopping; use the other for cutting knots and roots.
 - (8) Keep sheaths repaired.
 - (9) Avoid accidental or undue use of headlight batteries.
- (10) Protect field telephone or radio set against rough use. When carried in a car, it should be padded against vibration. Keep a ground rod and insulated wire for hooking up the telephone. A handy way to coil connecting wires is shown in Figure 24.

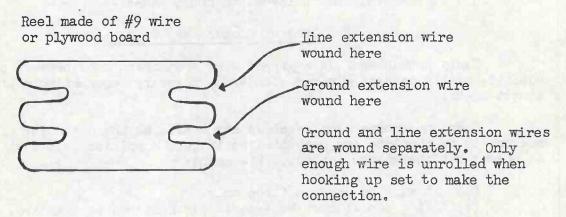


Fig. 24

- (11) All backpack cans and pumps should be thoroughly tested before the fire season and at each cache inspection throughout the season. Cans filled with water have been found to rust readily; therefore, cans should be emptied after each test, and not kept filled with water except as needed for building protection. Care should be taken to prevent kinks in the hose when storing or packing. Only light oil should be used on the pump.
- (12) The cutting edges of crosscut saws should be protected by saw guards (worn-out hose, canvas, or wood strip or board).

Equipment for Special Men

A fire guard on foot patrol should carry, as a minimum, a Pulaski tool or baby shovel and axe, a canvas bucket or water bag, and a one-day emergency ration. This equipment is to be a part of his smokechaser outfit and kept as such while at his regular station.

Packers and auto patrolmen should carry their full outfits at all times.

The care of tool caches should be as complete as the care of smoke-chaser outfits. They are used for fire only, reconditioned immediately after use, and kept in first-class condition throughout the fire season. A card is posted at each cache listing the items contained therein. Caches are usually sealed with car seals, which should be broken only in case of fire or inspection.

Transportation

Automobiles used by smokechasers must be in good mechanical order and equipped at all times with the following:

- (1) Spare tire mounted on rim and all tires properly inflated and in good condition.
- (2) Full supply of gasoline and oil.

(3) Good battery, starter, and lights.

(4) Adequate tool kit and tire repair outfit.

(5) Five gallons extra gasoline at his post of duty unless smokechase has access to nearby service station.

For smokechasers who use horses:

- (1) Pack and saddle equipment must be kept repaired and in good condition.
- (2) Equipment must be assembled and kept in the handiest place for quick saddling and packing.
- (3) Horses should be tied up or kept in a corral daily from 9:00 a.m. to 5:00 p.m., unless otherwise directed. During emergency period when fire calls may be expected momentarily, horses should be saddled.

Continuous Travel

Travel to a fire should be continuous. *** It is always possible to travel at night on roads or trails, and cross-country travel is usually feasible, except over very rough country. Compass courses can be run at night by two men with lights. The smokechaser should go as far as possible at night, and if it is impossible to find the fire because of darkness, he should remain in its vicinity so as to get to it at daylight. The night and early morning hours to 10:00 a.m. are the hours when the most effective work can be done.

Record Information for Finding Fire

Before leaving his station the smokechaser must be positive he has received and recorded all information necessary to enable him to find the fire. If he is in doubt about any point, no matter how insignificant it seems, he should not hesitate to request a clear explanation from the dispatcher. The written information must be taken to the fire.

Record Data on Lookout Form

The smokechaser should use the Lookout Report form (Form 1-R6) to record information. ** All data furnished by the dispatcher on a fire should be entered on the report form. Enter the plotted location on the back. Often more than one lookout will report information on the same fire. When this occurs, it is important that these data be recorded on separate Lookout Report forms (see Figure 25). All of the following information may be needed:

- (1) Station reporting: The smokechaser needs to know what lookout or lookouts can see the fire.
- (2) Location by landmarks: May serve to better identify the location of the fire and may give the smokechaser starting points from which to run a compass course to the fire.
- (3) Azimuth: To compute backsights and get the lookouts' lines of sight.
- (4) Vertical angle: Needed to spot locations on panoramic photographs.
- (5) Distance: Needed mainly to check location.
- (6) Township, Range Section: Needed to spot location on map, and to find fire by survey markings in the field.
- (7) Subdivision: A more accurate breakdown of (6).
- (8) Smoke drifting from: Needed to guide smokechaser to right or left of line of sight if fire is not readily found.
- (9) Volume, color, character: Needed as a guide to "pick up" the smoke and to tell what kind of fire he may expect to find.
- (10) Base sighted, Yes or No: Tells the smokechaser whether or not he can backsight to the lookout from the vicinity of the fire.

Do not fail to take completed Lookout Report form to the fire.

R-6 F.C. Hdbk. *****Deleted 2-25-53

TT-8-26

Form 1-R6 Rev. Oct. 1941

INSTRUCTIONS TO LOOKOUT

Fire No..41

	-	•	 ٠,
LOOKOUT REPORT			

Hemlock Butte

Read items (1) to (11) to dispatcher.

Do not repeat printing to left. Station reporting . . . (1) Seemore L. O. Location by landmarks (2) 3/8 mile north of Clear Creek at base of slope on south side of Hemlock Butte, 400' below large heart-shaped rock slide in heavy timber. Azimuth (3) 2680 14! Distance (5) 8-3/4 Twp., Range, Section. (6) T. 26 S.R. 7 E. S. Subdivision (7) NASE Smoke drifting from . (8) Southwest Volume, color, character (9) Small, blue, thin column Base sighted Yes or No (10) Yas Size, acres or fractions (11) 1/8 acre Originated from (cause) 7/15 2:05 p.m. Sighted...

Tangent offset 1' = 1 1/4 ft. per mile.

Keep diary of subsequent action on reverse.

U. S. DEPARTMENT OF AGRICULTURE PORRET SERVICE

Reported.

(over)

Record time sighted first. Record data for items (1) to (11) and report them to dispatcher who will then give Report Time and Fire Number. Record last items at once. Dispatcher will later furnish Name of Fire and Actual Location. Record latter on back. Enter on back currently all additional data as it becomes available.

INSTRUCTIONS TO FIREMAN

and a control of the
Complete front side with data furnished by dispatcher. Enter Platted Location on back.
Location: T. 26 S. R. 7 E. S. 21
Subdivision_NEISWIDescription_Approx.
1 mile northeast o. Johnson Ranch
Smoky Bu. LO AZ. 114°20'

(OAKLAND-11-13-41-30,000)

Fig. 25

Locate Fire on Map

Map and protractor should be kept close to the telephone. The smokechaser who uses an automobile will need an extra map so that one can be kept in his outfit at all times. Immediately following the recording of information on Form 1-R6, the smokechaser should spot the location of the fire on his fireman's map. The location by local landmarks (streams, ridges, buttes, peaks, lakes, meadows, roads, trails, old burns, clearings) and legal land description (township, range, section, $\frac{1}{4}$ section) will enable him to do this quickly. It is important that the smokechaser always plot the fire on his map before leaving his station.

Map and protractor should be with smokechaser at all times.

Panoramic Photograph

To complete the picture in his mind of the fire location and surrounding topography, the smokechaser should consult *** the panoramic photograph taken from station reporting. This will enable him to see in the photograph what the lookout sees from his station. The fire location should be plotted on the photograph by means of the azimuth and vertical angle readings. The azimuth scale is printed along the top of the photograph, but for vertical angles a separate scale is provided. Instructions for plotting are printed on this scale.

Plan Route of Travel

After recording needed information, the smokechaser and dispatcher should determine the fastest route to the fire. An intimate knowledge of the district—roads, trails, ways, timber, and topography—is necessary to do this successfully. The map should be consulted; no matter how well the smokechaser knows the country, the map will aid him to select the fastest route. The dispatcher may change the route slightly to enable the smokechaser to pick up help, provided total travel time is not increased.

When the smokechaser leaves his station the responsibility rests solely with him to find the fire quickly and take initial action on it.

Methods of Finding Fires

The smokechaser is often confronted with actually searching for a fire under difficult conditions. Study of the following illustrations will help him to solve many of the problems which he may encounter. He should be thoroughly familiar with each of them and use the one which will best enable *-him to solve the situation encountered.-*

Determine Azimuth and Distance from Known Point

This method enables smokechaser to determine how to reach fire from a known point (see Figure 26).

Fire is plotted by intersection of two lookout shots. Smokechaser is given a reliable fire location, told to go to section line board where road crosses the south line of Section 11, pace and run compass course east on section line to the south $\frac{1}{4}$ corner of Section 12, then run and pace course on azimuth 24° , distance 2500 feet, to the fire.

R-6 F.C. Hdbk. *Amended 2-25-53 ***Deleted 2-25-53 No. 73 Smokechaser can determine these data himself by use of protractor and map to plot fire location.

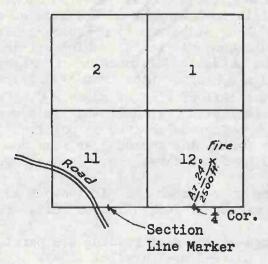


Fig. 26

Exact location of fire is not known, but it is known that the area in which fire lies is visible from Emergency Observation Point, (see Figure 27). Smokechaser is sent to this point to see smoke, obtain azimuth, and run compass course to fire.

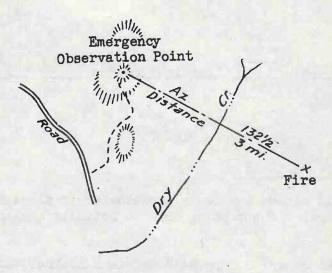


Fig. 27

Get on Lookout's Line of Sight

This method enables smokechaser to place himself on lookout's line of sight when compass shots to lookout are possible (see Figure 28).

Smokechaser has only lookout's azimuth converted to backsight and the information that the fire is on west side of Boulder Ridge. He arrives at point "D" on the ridge and takes a compass shot on backsight reading 268°. He sees that the lookout is to the right of his line of sight D-A, therefore, he must travel to right along ridge top to approach lookout's line of sight B-E. He estimates the distance "A" to "B", which will be the same as distance "D" to "E", and paces the estimated distance to the right along ridge top, arriving at "F". He takes a compass shot from "F", reading 268°, and finds that lookout is now to the left of line of sight F-C. Therefore, he must now pace to the left for an estimated distance C-B. This procedure may have to be repeated several times before he arrives at point "E". When lookout's line of sight is finally found, the smokechaser runs compass course on backsight reading 268° until he finds fire.

The important thing to remember is: If lookout is to right of line of sight, travel to the right; if lookout is to left, travel to the left.

All compass bearings of the same reading are parallel; therefore, lines of sight D-A, E-B. and F-C are parallel lines.

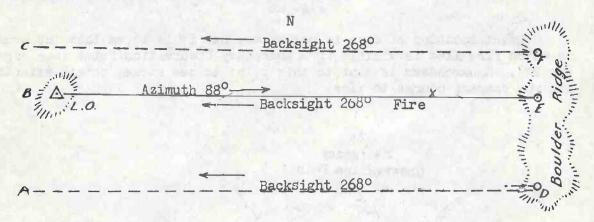


Fig. 28

Correlate Map and Ground Location

The use of this method enables a smokechaser to place himself on the lookout's line of sight without being able to actually see the lookout (see Figure 29).

A fire has been reported from Bald Mountain Lookout, base of smoke not visible. Smokechaser centers protractor over point on his map representing the lookout station. He extends a line at azimuth 183° (lookout's azimuth to fire) and finds where lookout's line of sight crosses road. Smokechaser then measures distance on his map from Red Creek bridge along the road to point where the lookout's line of sight intersects road and finds the distance to be $\frac{1}{4}$ mile. He travels $\frac{1}{4}$ mile up road from Red Creek bridge, then runs compass course to fire, using azimuth from lookout.

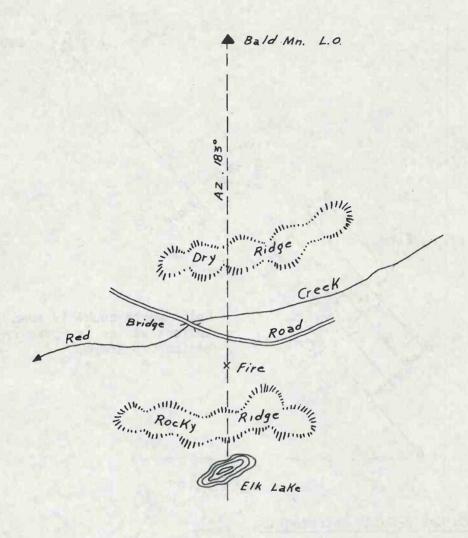


Fig. 29

Gridiron for Fire

This method is used when the smokechaser arrives in the vicinity of the fire but is unable to find it readily (see Figure 30)

Lookout "A" picks up smoke on line of sight A-B. He is looking over Dry Ridge and base of smoke is not sighted. Smoke drifting from northwest Smokechaser places himself on lookout's line of sight and runs compass course to plotted location but fails to find the fire. Since smoke drift was reported from northwest, he knows the fire must lie to the northwest of lookout's line of sight A-B. He turns a 90° angle at point "E" and runs compass course 400 feet to point "D", then turns a 90° angle and runs course to point "E". He continues turning 90° angles at points "E", "F", "G", etc., until fire is found.

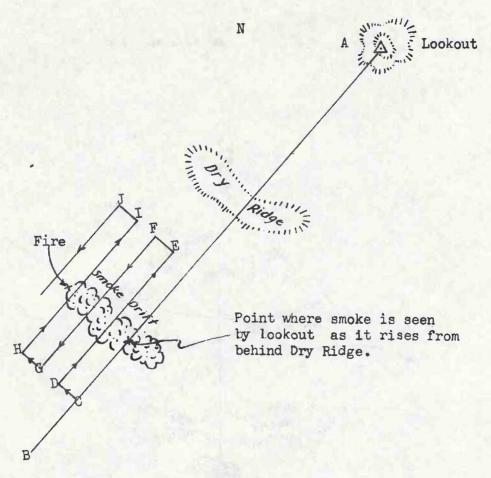


Fig. 30

Plot and Use 2-Point Intersection

This method enables a smokechaser to plot his location in the field and from this point to find the fire (see Figure 31).

Plotted location of the fire has been given to smokechaser, and he has it spotted on his map.

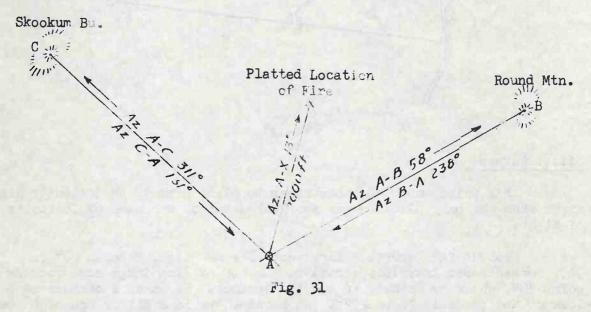
He arrives at "A" from where Round Mountain and Skookum Butte (points "B" and "C") are visible through openings in the timber. (Any two known points which are visible and which show on the smokechaser's map may be used.) He sets his compass at "A" and records azimuths A-B (58° to Round Mountain) and A-C (311° to Skookum Butte). He next converts these readings to backsights; $58^{\circ} + 180^{\circ} = 238^{\circ} = B-A$ (from Round Mountain to smokechaser); and $311^{\circ} - 180^{\circ} = 131^{\circ} = C-A$ (from Skookum Butte to smokechaser).

Placing his map on a flat surface, he centers his protractor on "B", extending azimuth 236° (B-A). The process is repeated for point "C". The intersection of these two lines represents his location at "A".

He then centers the protractor over "A", draws the string over X, which represents plotted location of fire, and reads azimuth A-X (130). This is the

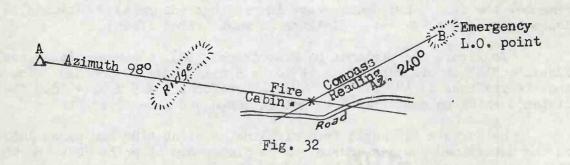
compass course from his present location to the fire. The distance A-X is scaled on the map and found to be 2,300 feet. (If no ruler is available a piece of notebook paper can be used, properly marked with map scale.)

The smokechaser runs a compass course on azimuth 13° and paces 2,000 feet to the fire.



Variations of 2-Point Intersection: Two variations of this method commonly used are:

(1) The smokechaser has lookout "A's" azimuth (98°) to fire and only a general description of its location, since the lookout is looking over a ridge and cannot see base of smoke (see Figure 32). Smokechaser goes to point "B", from which smoke is visible and takes compass shot (240°) on fire. He plots the two readings (azimuth 98°) from "A" and azimuth 240° from "B" on his map. Knowing the fire location with reference to local landmarks, he is then able to travel to it by the fastest route.



(2) Smokechaser wishes to determine his position on road (see Figure 33). He takes a compass shot on "B" (a known point), converts it to backsight reading, and plots the line on his map. The intersection (X) of this line with the road determines his position.

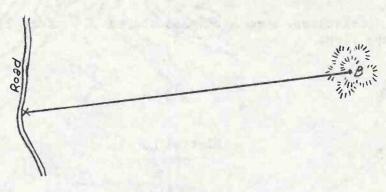


Fig. 33

Offset Method

This method enables smokechaser to place himself on lookout's line of sight when the only place he can see lookout is to one side of lookout's line of sight.

Lookout "A" reports a fire west of Pine Ridge, azimuth 88° (see Figure 34). Smokechaser travels up trail to the top of Pine Ridge and proceeds to point "B", where he is able to see the lookout. He takes a compass shot to lookout and finds it to be 272°. He notes there is a difference of 4° between his reading (272°) and the lookout's reading converted to backsight (268°). It is necessary for him to travel in a northerly direction to get on lookout's line of sight, but looking to the north, he discovers that Pine Ridge is heavily timbered and it is probable he will be unable to see the lookout again. How far from point "B" must he travel to get on lookout's line of sight?

The distance is determined as follows: It has been found by measurements that where the difference in the two readings is 1°, and the smokechaser is one mile from the lookout, the distance to be traveled is approximately 92 feet. If the smokechaser is two miles from the lookout, with a 1° difference in readings, the distance to be traveled is 18¼ feet. If the difference in readings is 2°, and the smokechaser is one mile from the lookout, the travel distance is 18¼ feet. For application of this method the smokechaser should remember the following: Difference in readings (degrees) x distance he is from lookout (miles) x 92 feet = distance he must travel (feet).

To figure the distance he must travel (BC), the smokechaser scales distance "AB" on his map, finds it to be 5 miles (see Figure 34). The difference in readings is 4° (272° - 268°). Therefore, $4 \times 5 \times 92 = 1840$ feet, the distance which he must travel to get on lookout's line of sight.

He turns a 90° angle from his line of sight "AB" and paces 1840 feet on the determined compass course, which places him at point "C". He then travels on course 268° until he reaches the fire.

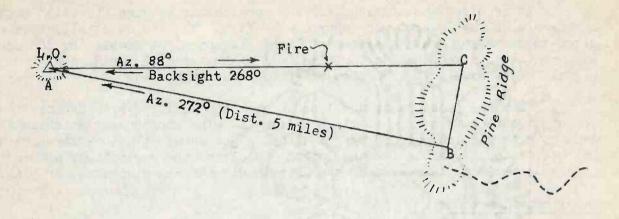
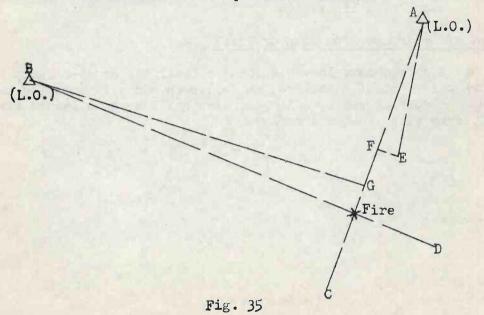


Fig. 34

Variation of Offset Method: A variation of this method can be used in flat, heavily timbered country where it is impossible to obtain frequent backsights to lookouts.

The smokechaser has backsight readings to two lookouts (see Figure 35). He arrives at point "E" from which lookout "A" is visible. He determines the distance "EF" and places himself at "F" on "A's" line of sight "AC" (by method illustrated in Figure 34). Unable to see lookout "B" from this point, he runs course on "A's" line of sight to point "G", from which he is able to see "B". He determines "GX", runs course, and paces distance, which should place him close to the fire.

Note: There will be a small error in the second offset since lines "BG" and "GX" do not make an exact 90° angle, but the error is within practical limits.



II-8-35

Arrange and Use Direction Signals with Lookout

It is often advantageous for the smokechaser to have direction signals —arranged with the lookout who reported the fire. This is especially true of night smokechasing where a system of light flashes might enable the lookout to direct the smokechaser to the fire. (1 flash for N, 2 for E, etc.) Signals might have to be repeated at frequent intervals.—*

When the smokechaser and lookout are both equipped with radios, the job of directing to a fire at night is simple. The smokechaser establishes contact with the lookout and by use of his light shows the lookout where he is. It is then possible for the lookout to direct the smokechaser either by reference to local landmarks or approximate directional distances, or both.

Supplemental Methods

*** The smokechaser might supplement methods illustrated in Figures 26 to 35 with one or more of the following:

- (1) Utilize local openings or points for observation. Take compass shot to fire.
- (2) Climb trees for view. Take compass shot to fire.
- (3) Locate fire by smell.
- (4) Note direction of smoke drift.
- (5) Utilize information as to whether base of smoke was or was not visible from lookout.
- (6) Run compass course at night. Two men with lights should work together, the smokechaser lining in his partner by means of a light. ***

Mark Point of Departure from Road or Trail

When a smokechaser leaves a road or trail for cross-country travel, he should mark his point of departure, so follow-up men will know the route he has taken. A notebook sheet, a limb across trail, or post leaned against tree will serve as an adequate marker.

FIRE CONTROL HANDBOOK REGION 6



PART II PREPAREDNESS

CHAPTER 9

GENERAL INSTRUCTIONS FOR FIRE GUARDS

PART II - PREPAREDNESS - Chapter 9

GENERAL INSTRUCTIONS FOR FIRE GUARDS

Table of Contents

	Page No.
Introduction	II - 9-1
Systematic Work	II-9-1
Forest Organization	11-9-1
Fire Fighting Objective and Policy Standards Getaway Time Night Work Stay With Fire Check Fire Classes of Fires Fire Report (Form 929)	II-9-3 II-9-3 II-9-4 II-9-4 II-9-4 II-9-5 II-9-5
Fire Prevention Fire Laws and Their Enforcement Federal Laws State Laws Campfire Permits Burning Permits Industrial Operations Closures Man-caused Fires Evidence Witnesses Power of Arrest Debris Burning Without Permit Campfires Without Permit Public Cooperation Public Contact Practices Personal Appearance Uniform Badge Furnish Information Forest Camps Fire Posters Appreciation for Public Assistance	II-9-11 II-9-11 II-9-11 II-9-11
Equipment and Quarters	

Table of Contents (Cont'd)	Page No.
Rules Governing Occupancy of Stations	II - 9-13
Lookout Windows	
-Communication-*	
Batteries	II-9-15
Portable Field Telephones	
Lightning Protection	
Open or Broken Line	II-9-16
Shorted or Grounded Line	II-9-16
Emergency Splice	
Fire Danger Rating	ASTALL .
Operation of Fire Danger Station	II-9-18
Fuel Sticks and Scales	
Wind Velocity	
High Elevation Stations	II-9-20
Rain Gauge	II-9-20
Visibility Measurements	
Ocalur Estimation	
Wet Visibility	II-9-21
Safety Rules	II-9-21
Tools	
Travel	
Fire Fighting Hazards	II-9-23
First Aid	II-9-24
Lightning	II-9-24
Training	
Pre-Season Training	II-9-25
On-the-Job Training	II-9-25
Telephone Training	
Self Test by Guards	
R6 F.C. Hdbk.	
*Revised 7-10-53 (ii) No. 76	

Table of Contents (Cont'd)

																				Page No.
Hire of Fire Fighters																				II-9-27
Diary																				II-9-27
Personal Supplies																				II-9-27a
Working Conditions .																				II-9-27a
Work Week																				II-9-27a
On Duty																				II-9-27b
On Call																				II-9-27b
Public Duties .																				II-9-27b
Ordered Overtime																				II-9-27b
Emergencies Invol-																				II-9-27c
Staying at Station .																				II-9-27c
Leave																				-II-9-27d-*
Work Other than Fire Co																				II-9-28
Special Equipment																				II-9-28
Expenses for Official '	Trav	re]	L				۰			۰										II-9-28
Physical Condition .							٠						۰							II-9-28
Supplement (Table of Co	onte	ent	S	 In	ic]	luc	lir	ıg	ST	oec	cia	al	Ir	st	ru	ict	ii	ons	3)	II-9-29 ·

GENERAL INSTRUCTIONS FOR FIRE GUARDS

Introduction

The fire guard is a member of the fire protective organization in the ranger district and the entire national forest. In this capacity he frequently represents the Forest Service in dealing with the public. Fire guards' main jobs are detection, dispatching, smokechasing, and fire fighting, which is explained in other chapters, but they have other duties and responsibilities, most of which are covered in this chapter. Some important items cannot be covered at guard training camp because of limited time. The guard will be expected to know the information contained in this chapter through study and self-training.

Systematic Work

A guard is expected to perform many duties. Frequently he is entrusted with great responsibility. In a single day his activities may vary from the repair of a telephone line to the suppression of a forest fire. Much of his routine work can be foreseen, but it is often subject to interruption. Systematic planning is necessary for the best use of this time.

A day's work can be more efficiently accomplished if a plan has been made. The plan need not always be written, but it should be thought through to a progressive rotation of jobs, an estimate of time, tools or materials needed, and a clear conception of how each job is to be done.

A guard should cultivate the habit of writing instructions, locations, supply lists, and other information. Trusting to memory can be one of the greatest causes of inefficiency.

Each project should be considered a series of individual jobs. After a complete picture of each job has been attained, its execution should be planned and carried through to conclusion.

When a guard is put in charge of a work crew, each man in the crew should be assigned one part of the work project and should endeavor to complete his job with the most efficient use of time. This requires that duties do not overlap, that work is delegated according to individual ability, and that instructions be specific and simple.

Forest Organization

A normal forest organization during the fire season is as follows:

The forest supervisor is in charge of the forest. Staff assistants are in charge of certain functions assigned to them by the Supervisor. The fire staffman is the key man of the fire organization for the forest.

The district ranger is in direct charge of a unit called a ranger district. All guards, improvement crews, and others working in his district are directly responsible to him. The assistant ranger, if one is employed, is *-usually-* second in command in a ranger district. In *-most-* districts a *-District Asst.-* serves as an assistant to the ranger.

The dispatcher, who usually is the ranger district clerk, *** has such authority and duties as the ranger delegates to him. He plots fires, secures action, trains guards by telephone or in place, and assists the ranger with office work. He may act as alternate for the ranger during his absence and issue instructions to other guards in the district. Sometimes certain dispatching duties are assigned to a lookout or to a ranger district dispatcher.

Lookouts are guards who occupy lookout stations to detect and report fires. Lookout-firemen are guards who occupy lookout stations to detect, go to, and put out fires. Firemen are guards employed to go to and put out fires. Prevention guards are guards who patrol certain areas to check forest visitors, prevent or discover fires, check industrial operations and perform fireman duties when necessary. Packers operate government pack strings part time and perform the duties of prevention guards or firemen. A smokechaser or fire goer is any employee who is sent to a fire for initial action.

**

Fire Fighting

Objective and Policy

The fire-fighting objective is to confine every fire to the smallest possible area. This can be accomplished only by prompt detection, accurate location and dispatching, quick arrival, and vigorous and intelligent work after arrival.

Important requirements of the suppression policy are:

- (1) Control as soon as possible on the day discovered or, failing in this, not later than 10:00 a.m. on the day following discovery.
- (2) Class A, B and C fires to be completely extinguished as quickly as possible. Do not abandon until last spark is out.
- (3) Class D and E fires to be mopped up quickly as possible to the point of safety. Mop-up work will be done as prescribed by the fire boss.

Standards

Forest Service experience in fire suppression has crystallized certain standards which have proved sound. They are as follows and the guard should know and apply them.

Getaway Time: Getaway time is defined as the time from the completion of the initial report and travel instructions to the guard to actual start for the fire. Standards are as follows:

(1) By foot or automobile - 3 minutes or less (2) By saddle horse - 5 " " " " (3) By pack and saddle horse *-15-* " " "

These standards can be adhered to only if the guard's smokechaser outfit is completely assembled, packed in his car if he has one, or in alforjas if horses are used. The guard's car must be in good condition; his riding stock readily available. He must be ready to start to the fire at a moment's notice, day or night.

Night Work: Upon arrival at a fire in the evening or after nightfall, the guard should size up the situation and determine whether it is possible to work effectively during the night without risking personal injury. In most cases work should be started at once to make sure the fire is controlled and made safe, or is out, before burning conditions cause it to spread more rapidly, which is usually by 10:00 a.m., but may be earlier.

Stay with Fire: The policy is: The guard will stay with his fire until it is out, or his supplies are exhausted, or he is relieved by a superior officer. Size of fire makes no difference.

Check on the progress of the fire will be maintained by lookouts and the dispatcher to determine if follow-up action is necessary. If the fire is too large for the guard to handle, and he has no communication, he can expect reinforcements. He should analyze the situation and take the action that will do the most good. This might be one or more of the following:

- (1) Try to keep fire out of bad fuels or dangerous places until help arrives.
- (2) Determine where to attack so crew can work effectively as soon as it arrives.
- (3) Blaze a line for the crew to follow from the road or trail to the fire.
- (\mathfrak{t}) Select a safe camp spot as close to the fire as possible. The work of one or two men before reinforcements arrive may help materially to reduce both area and cost of a fire.

An exception to the rule of "staying with it until is is out" might occur when a number of fires are started in the same vicinity. In such cases the guard should control the most dangerous one and go to the next, then keep working on each fire in turn until all are out.

Check Fire: A competent forest officer, as designated by the district guard, should inspect within 24 hours every fire reported as out unless the small fire was controlled and extinguished by a competent and trustworthy firegoer of unquestioned ability. In remote areas, where this is not practicable, the guard should remain at the fire for at least 6 daylight hours after the last spark is considered out, and, before leaving, make another thorough check of the entire fire and surrounding area, unless he is otherwise directed.

Classes of Fires

Class A $-\frac{1}{4}$ acre or less

Class B - More than $\frac{1}{4}$ acre, but less than 10 acres

Class C - 10 acres or more, but less than 100 acres

Class D - 100 acres or more, but less than 300 acres

Class E - 300 acres or more

Fire Report (Form 929)

Every guard who takes initial action on a fire must furnish certain important information to the ranger. This information is assembled on Form 929, Individual Fire Report. Instructions on Form R6-F26, Fireman's Fire Report, should be studied and strictly adhered to.

Fire Prevention

-Man-caused- fires are largely the result of carelessness or lack of information on the part of those who start them. Smokers and campers are responsible for the largest number. Each guard has a definite responsiblity in preventing man-caused fires. It is important to secure the good will of forest users and, with their help, prevent this type of fire, which constitutes a large part of our fire load.

Fire Laws and Their Enforcement

Use of the forests in Washington and Oregon is governed by either State or Federal fire laws and restrictions. The guard should know the ones applying to his district and be prepared to instruct others in the proper observance of them.

Federal Laws: Federal fire laws appear in the Forest Service Manual. The ranger will direct attention to those concerning the guard's work. Explain these to the public when issuing permits and at other times as opportunity offers. There may be special restrictions applied to certain areas in the ranger district, and if so, the guard should be familiar with them.

State Laws: State fire laws apply to national forest lands as well as to State and private lands. The ranger will furnish copies of these laws to guards having need for them, and will issue necessary special instructions covering local application of the various laws.

R-6 F. C. Hdbk. *Amended 6-24-52 No. 70 In Oregon, the Governor may by proclamation apply restrictions similar to Federal Laws pertaining to campfire permit requirements and the "no smoking while traveling" rule. In Washington, campfire permits are required by State Law, and the other two requirements are covered annually by regulations issued by the Department of Conservation and Development through the State Supervisor of Forestry. In both States hazardous areas may be closed to all use or to use except by permit.

In Washington there is a law which provides that every automobile be equipped with *- an ash tray -* in each compartment of the car. A sedan should be equipped with two such receptacles. There is no such law in Oregon, but it is Forest Service policy that all forest officers should equip their cars with such receptacles.

Campfire Permits: Forest Service Form 26-R6 may be used for campfire permits on lands other than national forest within the national forest boundary. In areas outside the national forest boundary, State permit forms should be used if available. Since State laws are different in Oregon, Washington, and California, the district ranger will instruct each guard as necessary in the procedure for his locality. Local instructions will also be given regarding the issuance of campfire permits for adjoining districts or forests.

Some of the things which a guard should do when issuing a campfire permit are:

(1) Address applicant by name.

(2) Specify camping location as definitely as possible.

(3) Suggest applicant read permit requirements before signing.
 (4) Secure approval from ranger if applicant wants permit for longer than ten days.

(5) Give original to permittee.

(6) If permittee is traveling by vehicle or horse, see that shovel, axe, and bucket requirements are complied with if applicable.

(7) When issuing a permit for private land, call attention to the fact that the permit does not authorize building a fire without the land-owner's consent (see last two lines on Form 26-R6).

Do not issue a permit if you know the owner objects to camping on his land.

Burning Permits: Permits to burn forest debris are required during the closed season. State forms are available for this purpose. In Washington the closed season extends from February 15 to October 15, unless the Governor, by proclamation, fixes a different date for beginning or ending. In Oregon the closed season extends from May 15 to December 31, but the Governor is authorized to advance it from May 15 to any date not earlier than February 1, or to terminate it any time prior to December 31. Guards will not issue state burning permits unless specifically directed to do so by the ranger.

<u>Industrial Operations</u>: Some guards are required to inspect industrial operations to see that state laws and forest standards are being complied with. Such guards will receive special instructions from the ranger.

Closures: Certain forest lands are sometimes closed to all use, or to entry except with permit or after registration. This is usually due

R-6 F. C. Hdbk. *Amended 6-24-52 No. 70 to extreme fire danger conditions, which include an excessive amount of inflammable debris such as is found in old burns or logging operations. It is essential that the guard be familiar with all such closures in his district. He will be instructed by the ranger as to closure dates and enforcement procedure. Such areas are usually shown on the fireman's map.

Man-Caused Fires: When fires are started in violation of State or Federal laws, the apprehension of the law violator is the ranger's responsibility, but the guard can give valuable assistance in gathering and preserving evidence and contacting witnesses. All evidence, no matter how insignificant it may seem, should be preserved. The guard should know (1) what constitutes a law violation (what State or Federal law or regulation has been violated), and (2) how to gather and preserve evidence, obtain statements of witnesses, and make other notes at the scene which will enable the ranger to secure a conviction.

Evidence: Upon arrival at a man-caused fire, the guard has two important jobs; (1) put the fire out, and (2) collect evidence which will help to identify the person who started the fire. While fighting the fire be careful not to destroy evidence such as tracks, papers, cigarette butts, or anything else that might help to identify the violator. Report the facts to the ranger.

To win a case in court the following questions must have answers and be supported by evidence:

- 1. What was the offense?
- 2. Where was it committed?
- 3. When was it committed?
- 4. Who did it?
- 5. Why did he do it?
- 6. How was it committed?

Memorize the words, What, Where, When, Who, Why, and How, and get the answers to them for every man-caused fire.

Witnesses: Interview all persons found in the vicinity of the fire. Record their names, addresses, car *-license-* numbers, and what they say. If anyone has information, he should be requested to sign a statement. If he objects to signing one, simply record what he says and note that he made such a statement but refused to sign it.

A satisfactory form of signed statement is as follows:

State of	Place		
County of	Date		
I	of		_do state:
That on theday of	etc		
	· · · · · · · · · · · · · · · · · · ·	e	
		Signed	
Subscribed to before me this	day of		19
,		Fire Guard	- (

Power of Arrest: All forest officers, including guards, have power to arrest persons violating Federal laws which apply to the national forests. They are not empowered to make arrests under State laws, except when they have commissions as State Warden (Oregon) or State Ranger (Washington) or are exercising the right of any citizen to arrest when he discovers someone in the act of committing a crime. If an act violates both State law and Federal law (which is often the case), the offender can be arrested for the Federal violation and prosecuted for the State violation. An arrest without a warrant can be made only if the violation is committed in the officer's presence or within his view.

No guard should arrest a law violator except under specific instructions from the district ranger or, in very unusual cases, where a violation is committed in the guard's presence. Even in such cases, formal arrest will ordinarily be unnecessary. The guard should ask the violator to accompany him and proceed at once to the nearest telephone to report to the ranger.

If a guard finds someone whom he has reason to suspect has committed a violation, he should report to the ranger, if this can be done without delay. If there is danger of the suspect leaving before instructions can be obtained from the ranger or his office, the guard should question the suspect courteously and tactfully. If he admits the violation, the guard should explain the law and then take the action that appears most practicable under the circumstances—ask the violator to accompany him to the nearest point, where he can communicate with the ranger, or ask the violator to stop at the ranger station on his way out of the forest. In any case, the guard should report to the ranger as soon as possible and be guided by his instructions.

Debris Burning Without Permit: Burning slash or other debris without permit during the closed season is contrary to law. If a guard discovers such a fire, he should find out if a permit has been issued for it. His action will be:

- (1) Permit issued. Determine if fire is safe and permit requirements complied with. If not, require permittee to take the action needed.
- (2) No permit. Guard should "size up" the situation and use good judgment. If conditions warrant, if it is the first offense, and if the guard has been given authority, he may issue a permit with a warning against future violations. If he considers the fire dangerous, he should require that it be extinguished.

In either case, the facts should be reported to the ranger as soon as possible. Further action will be the responsibility of the ranger.

Campfires Without Permit: If a guard finds a camper with a fire outside of a "posted" forest camp and without a permit, he should inform the camper of the requirements and find out why he failed to obtain a permit. If it appears that failure was due to emergency conditions, or ignorance due to lack of posted signs, and if the fire is in a safe place, the guard should issue a permit.

If the fire is in an unsafe place, the guard should require that it be extinguished, showing the camper how to drown the fire and assisting him to do so. A permit should then be issued and the guard should help the camper build a fire in a safe place, demonstrating how to build the fire properly.

If it appears that violation of the campfire permit requirement was flagrant, or it is known that the same person has committed violations before, the guard should not issue a permit, but should handle the case as indicated under "Power of Arrest".

Public Cooperation

Every guard is expected to use his influence to promote fire prevention. An excellent way for him to do this is through public contacts. He has an opportunity to tell the public what the Forest Service is, what it does, and how its administration of the national forests aids local communities and the nation. The guard who fails to contribute to this phase of public education fails in an essential part of his work. The national forests belong to the people, and it is important they realize the value of forest protection.

Cooperation is a two-sided word. We must give if we expect to receive. The success of our fire prevention program will depend largely on the amount of service which we give to forest users.

Public Contact Practices: Guards are often the only forest officers who contact forest visitors. The reputation of the Forest Service in the public mind is based largely on such contacts. It is important that forest users form a good impression of the guard, and through him, the work of the Forest Service.

Before fire prevention can be "sold" to a person, we must develop in him interest, a knowledge of what to do, and an incentive to do it. To accomplish this we must have, or develop, an ability to attract to ourselves the respect and loyalty of the folk with whom we deal. There are certain qualities which help us to attain that objective. Some are inherent; others can be developed. A few of them are:

- (1) Pleasing personality
 - a. Friendliness
 - b. Tact
 - c. Firmness
 - d. Sense of humor
 - e. Alertness
 - f. Ambition
 - g. Sincerity
 - h. Honesty
- (2) Personal appearance
 - a. Neat
 - b. Good carriage
 - c. Well groomed

- (3) Personal habits, quarters and equipment
 - a. Clean
 - b. Neat
 - c. Orderly
- (4) Good listener
- (5) Good attitude toward Forest Service
- (6) Well informed
- (7) Good judgment

When dealing with another man, remember that the opinion he has of himself is the most important thing in the world to him. Respect this opinion. To win good will, be interested in the other person's affairs and problems in a kindly, friendly, unassuming way.

A few public contact practices which will be of material help to the guard are:

- (1) Be courteous.
- (2) Show a willingness to be helpful.
- (3) Do not be officious or unduly intrusive on the privacy of others.
- (4) Do not engage in arguments, controversies, or policy discussions with others.
- (5) Know and adhere to the Department of Agriculture restrictions on political activity.
 - (6) Have patience in answering questions.
 - (7) Give information cheerfully.
- (8) Whenever practicable, demonstrate good fire prevention practice rather than describe it.
- (9) Know your job and be able to describe its purposes and interesting features.

Personal Appearance: The guard will be expected to maintain a good personal appearance. He should keep clean shaven, as well-groomed as possible, and as neatly and cleanly clothed as practicable considering the type of work which he is doing.

Uniform: Every guard is required to equip himself with a standard guard uniform, unless the ranger tells him it isn't necessary (see Supplement for specifications). The uniform must be worn while on duty, unless engaged in rough work.

When engaged in rough work such as fire fighting or telephone, road, trail, or other improvement work, overalls or other washable clothing can be worn. The clothing should be free of insignia except the "Forest Guard" badge in the usual position on shirt or jumper.

Information can be obtained from the ranger regarding place of purchase and approximate cost of the guard uniform.

Badge: Each guard shall wear the regular guard badge when on official duty. It should be pinned on left breast of shirt above, or through, the upper part of the pocket. Care must be taken that badges are not lost.

Furnish Information: An excellent way to obtain public cooperation is to furnish requested information. The guard should prepare himself to answer questions intelligently and dispense information accurately. To do this he must acquire certain essential local information. Much of this can be obtained from recreation folders and other available material.

The guard should have a knowledge of the following for his district:

- (1) Roads, trails, streams, and other topographic features.
- (2) Camping places, including "posted" forest camps.
- (3) Areas closed to entry.
- (4) Fishing and hunting conditions and laws.(5) Areas closed to fishing and hunting.
- (6) Points of historical interest.
- (7) Common tree species.
- (8) Wildlife common to the locality.
- (9) Forest resources and how they benefit local communities.

Forest Camps: Some places within the national forests are ideally situated for camping. Where public use warrants, and as funds become available, such places are developed. Forest camps which are considered "safe" against the possibility of spread of fire are posted with a sign "Campfire Permits Not Required on this Forest Camp". These are "Posted Forest Camps".

The guard should know the names, locations, andfacilities of all forest camps in his district. Also, he should know whether a campfire permit is required to build a fire on them. Forest camps have been made comparatively safe. The public should be encouraged to use them instead of stopping elsewhere and building a fire in an unsafe place.

Fire Posters: Fire posters are displayed in the forest to remind the public to exercise thought and care in the use of the forest and in the disposition of all burning materials. Posters are located according

to a definite plan prepared by the ranger. They are put up in the spring or early summer and taken down in the fall. Guards who put up posters will do so under instruction from the ranger. Every guard has the following maintenance responsibilities:

- (1) Make sure poster is plainly visible. This may require that brush around it be cut.
 - (2) Replace defaced or torn posters.
- (3) Report to the ranger any observed defacement of posters or signs. If possible, collect evidence as to the trespasser.
 - (4) Remove posters when they no longer apply or are out of date.

Appreciation for Public Assistance: Frequently fires are reported or extinguished by people living in or near the forest or traveling through it. The guard should do everything possible to encourage this type of public assistance. People who report or extinguish fires are a great help to the protective force. Guards receiving such reports should never fail to express appreciation. The person's name and address should be obtained and reported to the ranger so he also can express the appreciation of the Forest Service.

Equipment and Quarters

The proper care of equipment and quarters is an important responsibility of every guard. His station should be clean and orderly at all times.

Fire Protection

All stations must have adequate facilities for fire protection. Fire extinguishers, if available, should be kept in a handy place and promptly serviced after use. Stations equipped with a water system should have enough hose to insure delivering a stream of water to all parts of the building. Stations which do not have a water system should maintain, as a minimum, a filled back-pack can at all times. The pump must be in good condition. Defective stovepipe should be replaced. A bucket of sand and a ladder should be maintained if possible. The grounds adjacent to the station should be fireproofed. Dead grass should be eliminated within a 15-foot strip around all buildings. Accumulations of inflammable material other than grass should be eliminated for at least 100 feet from all buildings. The guard should take every precaution to prevent fires from occurring at his station.

Sanitation

Every guard is required to maintain sanitary conditions at his station. Garbage should be dumped regularly in the pit provided. If an open pit is used, a little soil should be thrown over the top of the garbage after each dumping. The latrine should be kept clean and as flyproof as possible. Use lye frequently. Window and door screens should be tight and free of holes. Dishes and cooking utensils should be rinsed clean of soapy water. The drinking water supply should be checked occasionally for foreign matter. All measures which insure sanitation should receive the careful attention of the guard.

Wood and Water Supply

An adequate supply of wood and water should be maintained at each guard station at all times. This is especially true of lookout stations. A "water" schedule will be worked out by the ranger. Lookouts should adhere to it. The ranger will allow the guard time to cut wood. A two weeks' supply should be maintained. If a guard is sent away from his station for longer than a day, he should leave at least a day's supply of wood in the house.

Rules Governing Occupancy of Stations

"Rules Governing Occupancy of Seasonal Field Stations," Form 96a, should be posted inside of every guard station. The guard must abide by these regulations.

"Property Notice," Form 244, will be posted on the fronts of all Government-owned guard stations.

Caulked or hobnailed shoes should not be worn in a guard station.

The only exceptions to this rule will be made by the ranger for individual cases.

Lookout Windows

The lookout must wash the windows of his station at the beginning of the season and at least once every two weeks thereafter. They should be cleaned after each rain. Fires cannot be detected through dirty windows.

Closing Station

Guards will be held responsible for performance of the following duties when closing their stations at the end of the season:

- (1) List <u>all</u> equipment at station, note its condition, and give list to the ranger.
- (2) Apply a light film of oil or grease to stove, tin dishes, and all other articles subject to rust. Do not use lard; it will cause rust.
- (3) Unless otherwise directed, take down the stovepipe and place a can or bucket <u>securely</u> over the top of the safety flue outside. Remove all ashes from the stove.
- (4) Burn or bury all discarded clothing, papers, cans, perishable food not being taken out, or other refuse.
- (5) Mattresses and other articles subject to damage by rodents should be suspended from the ceiling by wires.
- (6) Leave at least a three-day supply of wood in the station and a two-weeks' supply outside.

- (7) Sweep and clean the station.
- (8) Remove and store screens inside.
- (9) Unless otherwise directed, pull the disconnect switch and remove batteries from the telephone.
- (10) Do not leave compasses, abney levels, or other small valuable items in the station.
 - (11) Close and lock the windows and door.

Lookouts, in addition to the foregoing, should:

- (12) Close and fasten <u>securely</u> all shutters, including the one over the door.
- (13) Apply a film of good oil to all parts of the fire finder. Don't use lard.
 - (14) Completely cover fire finder with piece of canvas.
- (15) Loosen tower guy cables slightly just enough to eliminate strain, which will allow for contraction during the winter cold.

Guards having fire danger stations should:

(16) Carefully examine and store inside all instruments that are in good condition. Those in need of repair should be taken to district headquarters with repair work noted on a tag attached to the instrument. Fragile instruments should be packed carefully before transporting. Wind gauges should be complete (except for buzzers, wire, switches, and batteries) when sent in for repairs. If one thermometer of a psychrometer is broken, the undamaged one should be sent in so it can be matched. Fuel stick scales should be oiled with a light cost of mineral oil to prevent tarnishing. Rain gauges should be emptied.

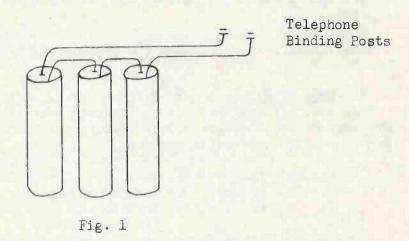
Communication

Dependable communication facilities are essential for quick and effective fire control. Telephone systems will be maintained and radiophones serviced before the fire season. They must be used properly to obtain the greatest efficiency. A defective communication system seriously cripples the entire organization. Keep it functioning well.

Telephones

The telephone system is the first line of communication. There are certain things which every guard may have to do to maintain it. One <u>important</u> thing to remember is to stay off the line when other parties are using it. "Listening in" lowers the efficiency of the system.

Batteries: Telephone batteries furnish the electric energy to carry the voice over the wire. The guard should know how to connect batteries properly. Without batteries, or with improper hookup, he cannot make himself heard over the phone. Batteries are connected in series; the center post of one to the outside post of the next (see Figure 1).



Portable Field Telephones: Frequently it is necessary for the guard to use a portable field telephone. To use it on a "grounded circuit" (a one-wire line), connect one lead (sometimes marked "L" or "L-l") to the line. The other lead wire (sometimes marked "G" or "L-2") should be connected to a ground rod driven in damp ground (see "Telephone Grounds").

To use the field telephone on a "metallic circuit" (a two-wire line), connect one lead to one line wire, the other lead to the other line wire. Either telephone lead can be connected to either line wire.

The "hand set" type of field telephone has a button between transmitter and receiver. This button must be held down while phone is in use.

Telephone Grounds: In a "grounded circuit" the telephone ground is as important as, and takes the place of, the second wire in a "metallic circuit." Usually the ranger will make ground connections for all permanent phones, but the guard should know how to establish a good ground for his field phone. This is best accomplished by having a rod approximately 18 inches long with the lead wire securely fastened to it (preferably soldered). This rod can be driven into the ground.

The best grounds are established in wet soil around seeps or creeks. If wet soil cannot be found, drive the rod into dry soil and pour water around it. If a rod is not available, bury two or three feet of telephone wire. If it is impossible to establish aground in the soil, drive a nail or rod (with lead wire attached) into a living tree root below the soil surface.

Lightning Protection: If lightning strikes a telephone line, or a power line falls on it, the telephone will burn out if not protected. Switches, fuses, arresters, and discharge gaps are used to give the phone this needed protection.

The guard should find out what type of protection his phone has and be prepared to check for failure at this point. If in doubt as to what to do at the approach of, during, and after lightning storms, consult the ranger.

<u>Common Troubles</u>: Every guard should know how to locate common telephone trouble.

Open or Broken Line: Turn the crank. If you cannot ring or talk to anyone, nor can they ring or talk to you; if the crank turns easily and your own bell rings (except Kellogg which ordinarily never rings its own bell), the trouble may be:

- 1. Line fuse burned out.
- 2. Poor ground or broken ground wire.
- 3. Line break close to station.

Replace fuse with new one (use a small wire <u>temporarily</u> if new fuse is not available). If crank still turns easily, look for broken wire or loose connection between fuse and telephone. If the trouble is not yet found, the line or ground wire must be broken.

Shorted or Grounded Line: Turn the crank. If crank turns hard and your bells do not ring at all or only weakly (except the Kellogg), if your ring comes in weak at the station which you are calling, if the other person's ring is weak at your phone, the trouble may be:

- 1. Something on line which is causing a "short" or ground.
- 2. Line and ground wire in contact with each other.

Open switch near your phone, or pull the fuse block, and ring. If crank turns easily the trouble is somewhere along the line. If crank turns hard the trouble is in your telephone or in the wiring between telephone and switch.

Poor Battery Connections: If you can ring and hear others, if they can ring but cannot hear you, the trouble may be:

- 1. Weak batteries.
- 2. Batteries connected wrong.
- 3. Loose or broken battery connections.

Examine battery connections. If they are satisfactory the trouble may be weak batteries.

Emergency Splice: The guard should know how to repair a line break without tools. The emergency splice is made as follows (see Figure 2):

- 1. Make an "eye" in the end of the first wire (a). Leave about two feet of loose end.
- 2. Pass the end of the second wire through the "eye" and bend it back. Leave about two feet of loose end.
 - 3. Pull as much slack as possible from the line.
- 4. Make about two wraps in the second wire (b) and bend it over to the first wire. Make three or four tight wraps (c).
- 5. Bend the loose end of the first wire over to the second wire and make three or four tight wraps(d).

Note: Fairly tight wraps can be obtained by putting a stick through the "eye" and twisting the line as the end of the wire is held. The tighter the wraps, the better the line will function.

6. Leave a marker and note on the road or trail so the emergency splice can be found easily and replaced with a standard splice.

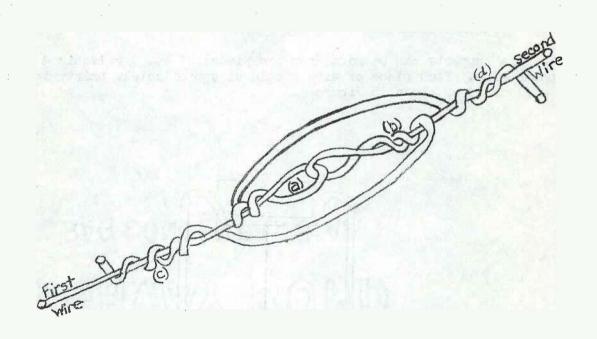


Fig. 2

Radiophones

Forest Service radiophones are used to supplement, or take the place of telephone service. Their most important use is for communication on forest fires. Radiophones should be used for business only.

Fire Danger Rating

Fire danger rating is used to determine the effect of weather factors and fire starting agencies on the start, spread, and discovery of fires for a given fuel and topographic condition.

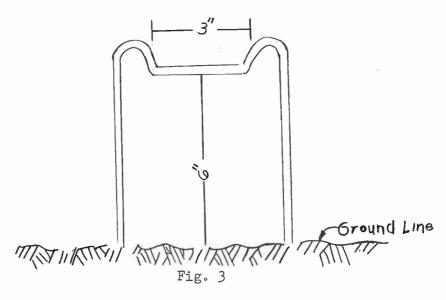
The guard should know how to operate and maintain the instruments and record observations at a fire danger station.

Operation of Fire Danger Station

A fuel moisture indicator stick scale, a set of $\frac{1}{2}$ " fuel moisture indicator sticks (new each year), and a wind gauge comprise the minimum equipment required at a fire danger station. Rain gauges and wind vanes are optional but desirable equipment. Either a standard metal vane or a homemade wooden vane can be used.

Fuel Sticks and Scales: Wire supports, exactly six inches above the ground, should be used for the fuel sticks. Plants should not be allowed to shade or grow up against them.

Wire supports can be made from two pieces of No. 9 galvanized telephone wire. Each piece of wire should be approximately thirty inches long and shaped as shown in Figure 3.



R6 F.C. Hdbk. ***Deleted 7-10-53

When no standard instrument shelter is available, the scales can be mounted on a tree or post in a sheltered spot, but they should be protected from the weather by a shelter constructed from available material. If a garage or other building is convenient, the scales should be mounted inside.

Always read the fuel stick scale to the nearest full per cent; that is, if the scale registers $5\frac{1}{2}$ per cent, record as 5, but if the scale registers 5-3/4 per cent, record as 6. Keep the fuel sticks clean and handle them with clean hands. If pieces break off the fuel sticks or if they are damaged by porcupines, or other animals, request a new set from the ranger. The fuel sticks must be left outdoors on the wire supports except when being weighed.

Make sure each day that the scales are in a vertical position and that the pointer coincides with the "O" mark when the test weight (without the fuel sticks) is hanging on the loop. The test weight should not be left hanging on the loop as it causes excess wear on the scale beam. If the scales are rigidly attached to a tree, building, or firmly set post, they will seldom get out of a vertical plane; if the pointer does not coincide with the "O" mark when using the test weight, the instrument can be correctly adjusted by loosening the wing nuts and shifting the face of the scale.

Wind Gauge and Wind Vane: The instrument should be at least 100 feet from buildings or other objects that obstruct the free movement of air currents, and mounted on a pole exactly 10 feet above the ground. In situations where this is impossible, the instrument can be located up to 1,000 feet from the buzzer provided that No. 14 weather-protected wire is used with at least three telephone batteries.

Wind gauges should be oiled only with the high-grade oil supplied by the ranger. The ordinary light mineral oils sold as household lubricants are corrosive and will gradually pit small ball bearings. About six drops of oil once a month is sufficient. The wire connections between the wind gauge, buzzer, and batteries should be cleaned frequently to insure good contacts.

Wind gauges are precision instruments and will not operate correctly unless maintained in proper working order. If the instrument no longer works correctly notify the ranger. It should not be tampered with in the field.

On the wind gauge with four spokes and half-cylinder cups, the cups should be exactly 3-13/16 inches across the face. If the cups become bent, they should be adjusted to this dimension. The cups should be permitted to run free at <u>all</u> times and should not be stopped or hindered by homemade devices.

Wind Velocity: The following procedure for measuring wind velocity should be used:

Low Elevation Stations: At low elevation stations, or other

locations where the wind velocity seldom exceeds 10 m.p.h., one L-minute measurement at each regular reading will provide satisfactory results.

High Elevation Stations: At high elevation stations, or at any station where the wind often exceeds 10 m.p.h., two 4-minute measurements one half hour apart should be taken and the average velocity of the two periods recorded. The first measurement should be taken one-half hour before the regular reading time and the second at the regular reading time. Thus, for the afternoon reading, there would be one measurement at 4:00 p.m. and another at 4:30 p.m.

The standard R6 four-cup or four half-cylinder cup gauges and the Chisholm three-cup gauge were designed for 2-minute measuring periods; the Friez gauge, which the U. S. Weather Bureau supplies for some of its cooperative stations, was designed for a 1-minute measuring period. adapt these instruments to a 4-minute measurement, it will be necessary to divide the number of buzzes recorded in a 4-minute period by two for the first-mentioned types and by four for the Friez type, before reading the table to obtain the wind velocity.

The ranger will determine whether the guard should divide by two or four. The weather bureau will usually furnish a table giving the correct wind velocity for each number of buzzes for each type of instrument.

Psychrometer: (For only those guards who determine relative humidity). If there is an instrument shelter available, the fan psychrometer should be located in it. If no instrument shelter is available, the relative humidity readings should not be taken in direct sunlight.

Stations equipped with hygrothermographs will be supplied with special instructions for their operation by the U. S. Weather Bureau.

Rain Gauge: All stations equipped with a standard U. S. Weather Bureau or Forest Service rain gauge should record the 24-hour rainfall ending at 4:30 p.m. on U. S. Weather Bureau Form 1009-E. Instructions for measuring are stated on the cover of the form.

Visibility Measurements: Visibility distance is determined either with a visibility meter or by ocular estimation.

Visibility Meter: Visibility distance can be determined accurately with a visibility meter (instructions in the box). One or more lookouts in a district are usually equipped with them.

Ocular Estimation: If not provided with a visibility meter. lookouts should estimate the visibility distances to the north, south, east, and west, and average the four distances (omitting from the average any directions cut off by topography or timber). Visibility is based on the distance which smoke from a small fire (10x20 feet) can be seen.

Blue-white smoke can be seen farther against a timber background than against a light-colored, snag background, or against a brush field. A standard background should be chosen for each of the directions for which a visibility estimate will be made. This choice should be based on the type of background which predominates in a given direction. Thus, if to the north a green timber background is selected as standard, observations should always be based on a green timber background when estimating visibility in that direct on.

Careful measurements have proved that smoke in full sunlight can be seen as far when the observer is looking toward the sun as when looking away from the sun. This is the opposite of what might be expected. The smoke column is illuminated by the reflection of the sunlight on particles in the column. Dark objects such as ridges and trees cannot be seen as far when looking toward the sun through a hazy atmosphere as when looking away from the sun. Smoke in the shadow of a ridge has visibility characteristics more like ridges or trees and cannot be seen as far when looking toward the sun. These facts should be given consideration when estimating visibility toward the sun.

For many lookouts there are p rmanent or semipermanent legitimate smokes which will assist in estimating visibility distance. Thus, a train passing a certain point each day, smoke from a small sawmill, or a white rock slide, would serve as a check. In any case ocular estimates of visibility distances should be made by some careful procedure ather than merely by an offhand guess.

<u>Dry Visibility:</u> Visibility that is reduced by smoke, ust, or haze is denoted as "dry" and should be reported as such.

Wet Visibility: Visibility that is reduced by some form of atmospheric moisture, as rain, fog, mist, or snow, is denoted as "wet" and should be reported as such.

Records and Reports

All regular fire danger stations selected to supply certain specialized information will be provided with U. S. Weather Bureau Form 1009-E. Guards not furnished this form will maintain their records in their diaries.

Safety Rules

Every guard should make a determined effort at <u>all</u> times to prevent accidents. Some of the most common causes of accidents and their preventive measures are listed in the following paragraphs. Common sense and good judgment will help to prevent accidents. Think before you act.

At the Station

Splitting wood and handling inflammables are common causes of injury at guard stations.

*Splitting Wood: Plenty of room should be allowed for splitting wood. Stay away from the telephone line, clothes line, or any other object which might deflect the axe. A short-handled axe should always be used for splitting wood. The handle should be solid and the head tight. The "swing" should be as short as practicable. Never use a battered wedge for splitting wood as sharp pieces of steel fly off when struck with the sledge. Likewise the sledge should not be battered. If either are battered, dress them smooth with a file or replace them before using.

Storage and Handling of Inflammables: Gasoline, kerosene, and other inflammables should <u>not</u> be stored inside the guard station. Lanterns and lamps should be filled out of doors and in daylight if possible. Never light matches around gasoline or kerosene storage.

Tools

*All tools should be maintained in good condition and used properly. Sharp tools are easier and safer to use than dull ones. Sharp-edged tools should be protected with guards at all times when carrying or packing.

Axes, pulaskis, and saws are dangerous when used in a careless manner.

When using an axe or pulaski:

- *1. Don't carry it over shoulder when traveling.
- *2. Don't use one with a loose head, bent or splintered handle.
 - 3. Don't chop toward your feet.
- 4. Don't start chopping until you have cleared away limbs within reach of your swing.
 - 5. Don't swing it wildly or let it get out of control.
 - *6. Obtain proper balance of body and solid footing before swinging.
- *7. Don't leave it sticking in stumps or leaning upright where someone might fall on it or stumble over it.

When using a saw:

- 1. Don't carry it with the teeth toward your body.
- 2. Don't walk immediately behind a person carrying one.
- 3. Don't leave it where someone might fall against it.

Footwear

*It is important that the guard have proper footwear. Composition sole, caulked, or hobnailed boots or shoes should be worn for field work.

*Boots should fit well to eliminate the probability of forming blisters.

Do not neglect blisters. Cover them with a bandage. Apply an antiseptic before retiring. Keep socks clean.

Travel

Certain precautions should be taken for various methods of travel.

*By Foot: Guards have sustained serious injuries by tripping over rocks, roots, or holes when hiking. Be careful. Look before you step or jump.

*By Horse: Do not tie lead rope of pack horse to your riding sad dle. If you use a horse, obtain a copy of "Instructions on Horse Packing," Part 1, Section 2, F.C.E.H., and follow the instructions contained therein.

*By Automobile: Maintain steering gear, tires, lights, and brakes, in good condition. Check them frequently.

Regulations require <u>any</u> guard who drives a Government vehicle to have a U. S. Department of Agriculture driver's permit in his possession. All motor vehicle accidents should be reported to the ranger as soon as possible. Form 26 (report of accident) should be filled out at the scene of the accident.

At Night: Graded foot trails can be traveled at night with or without a light, but cross-country travel, particularly in rugged country, usually should not be attempted without a light.

What to do if Lost:

If lost in the woods, above all things keep <u>calm</u>. Take sufficient rest periods to conserve energy. Travel to openings on ridges or peaks to command a broad view of the country. Look for familiar landmarks and locate your position by compass, protractor, and map. Do not travel in circles. Use your compass to maintain straight courses.

If night is approaching, select a good camp spot near water. Gather plenty of wood to insure a fire all night. In the morning, continue your efforts to find a way out (be sure your fire is out before leaving.) As a last resort, in rugged country, travel downhill, get to a watercourse and follow it to the settlements in the lower country.

Fire Fighting Hazards

The greatest fire fighting hazards are falling trees and snags and rolling rocks. The guard should be on the alert constantly for these dangers.

- 1. Do not lie or sit down within reach of a burning or unsafe tree or snag which might fall.
- 2. Avoid passing a burning tree or snag on the downhill side or under its lean.

R-6 F.C. Hdbk. *Revised 5-15-46 No. 34

- *3. If you hear a tree falling, do not run blindly. Determine the direction of fall and get in the clear. Never fall a tree or snag without giving a warning to persons nearby.
- 4. If on fire patrol, have the location of dangerous trees or snags in mind and be alert when near them. Determine these hazards before dark.
- *5. Keep alert for rolling rocks or logs on steep slopes. If others are working below, give them a warning if possible.
 - *6. Avoid stepping in hot ashes.

First Aid

Wherever possible, the guard should participate in a regular first aid course. If such training cannot be obtained, it is recommended he study the American Red Cross First Aid Book. If that is also impossible, he should obtain a copy of some other first aid manual, study it, and be prepared to practice the fundamentals of first aid treatment.

Report Injuries to Ranger

*All injuries or serious illness sustained by guards should be reported to the ranger as soon as possible. If injured in the performance of duty, guards will be given medical treatment through the U.S. Compensation Commission regulations. The ranger will fill out the necessary forms and see that the guard visits the proper physician.

Lightning

Precautionary measures which should be taken during a lightning storm are:

- 1. Do not seek shelter under isolated trees.
- 2. Do not touch metal of any kind.
- 3. Keep away from wire fences and low-hanging wires.
- *4. If possible, go into a building equipped with lightning protection, get into an automobile, or get under a steel bridge. (If under bridge do not touch the steel.)
- 5. Keep away from open doors and windows, chimneys, stoves, plumbing fixtures, lightning conductors, and downspouts.
 - 6. Stay near the center of a room if possible.
- 7. Do not use telephone or radio unless absolutely necessary. If necessary, be sure to stand on insulated stool or rubber mat.
- 8. Seek protection of dense woods, caves, depressions in the ground, deep valleys or canyons.

Training

Each fire guard has an important and responsible position in the fire organization and the ranger is dependent on him for fast, aggressive action on fires. In order to fully redeem his responsibilities each guard must understand and be able to perform the many duties required of his position. This can be accomplished by a combination of planned training and experience.

The Guard Training Plan and Record

Each year well in advance of the fire season a training plan is made for each guard. "Guard Training Plan and Record" sheets which apply to each station are selected and jobs in which the guard needs training or review are checked off. All of the training a guard may need cannot be given or absorbed in three or four days, and for this reason it is divided between pre season, guard camp, on the job, telephone, and self training. When and where certain training jobs can best be given are noted on one copy of the guard's Training Plan and Record which is kept at ranger district headcuarters. The guard's copy of the Training Plan and Record is inserted as Part One of the supplement to this chapter. Its purpose and use is described below.

Pre Season Training

When new guards are employed well in advance of the fire season, they may be sent copies of the Fire Control Handbook chapters they will need and other pertinent material to familiarize them with their job. Study of this material will acquaint the guard with fire control terms and procedures and will make it much easier for him to grasp first hand instruction later.

Guard Training Camp

The guard training camp is planned primarily to give basic instruction to inexperienced guards and for review and advance training for experienced ones. The national forest or ranger district camps are usually scheduled for three to six days prior to the time the guards go on their stations. Guard camp training is necessarily intensive and much of the instruction given is likely to be missed unless the guard concentrates on the instruction given in each subject, studies written instructions, and asks questions on any point that is not clear to him.

On The Job Training

After the guard training camp is completed an experienced forest officer usually accompanies new guards to their stations or visits them within a few days. At this time instructions received at the camp are reviewed and localized and further instruction is given on "Learning the Country". "On the Job" training is carried out for all guards during

R 6 F.C. Hdbk. Revised 2 15-44 No. 17

There we mere closed be

the first part of the season. The guard should be sure to use his Training Plan and Record for checking jobs which, in whole or in part, are causing him trouble, so they may be taken up at the time of these visits.

Telephone Training

It has been found that effective training can be given to the guard by telephone. Training over the telephone is usually handled by the assistant ranger, district guard, dispatcher, telephone operator, or other qualified forest officer. Priority will be given to those jobs checked for training over the telephone (symbol "T") in the district headquarters "Guard Training Plan and Record." Suitable problems will be prepared and given to the guard for practice in applying instructions and for testing his understanding, speed, and accuracy.

3.50

Self-Training

Guards will appreciate there is insufficient time to provide instructions in all of the minor or detailed duties of a guard position, and for this reason certain jobs listed in the "Guard Training Plan and Record" are checked with the symbol "ST" (self training). The guard is expected to refer to his Training Plan and Record and to learn these jobs or procedures by study of written material furnished and by practice. As each job is mastered, the guard should indicate this fact by placing his initials and the date in column three of the "Training Plan and Record". Inexperienced guards should not hesitate to call on any forest officer, including experienced neighboring guards, for help if necessary.

The following are a few ways of accomplishing self-training and gaining proficiency. In all cases, study of instructions should precede practice.

- 1. Practice pacing known distances on level ground and up and down slopes. A good time to practice pacing is when going after water or when making other trips.
- 2. Learn the names of rivers, pecks, burns, and other landmarks end practice estimating their distance from the station. Use maps and panoramic photographs to help gain accuracy.
- 3. Acquire ability to designate any point on fire finder or map by legal description and local landmarks. Practice describing any point seen from the lookout by reference to a local landmark.
- 4. Practice running compass lines and locating section and quarter corners and other field markings whenever possible.
 - 5. If horses are used, practice saddling and packing.
- 6. Guards on lookout stations should study the country in each 10° to 45° segment of the fire finder. Assume a fire 1, 3, and 6 miles distant and make out a lookout report on scratch paper. Plan the best route of travel, and visualize what the probable burning conditions and difficulty to control would be under various conditions.

R-6 F.C. Hdbk. Revised 2-15-44 No. 17

Self-Test by Guards

Guards are expected to make two self-tests during the season: the first within ten days after going on the station, and the second about one month later, unless other instructions are given. The guard should test himself on each job listed in his Training Plan and Record. If after repeated trial, as nearly like the real thing as possible, he feels sure he can do the job in accordance with established standards and understands why it is done, he should rate himself with the symbol "S". If, on the contrary, there is something about certain jobs he cannot do or does not understand, he should check them with the symbol "N". Be assured that any jobs checked with an "N" will not be considered a reflection on the guard, but will be recognized as a need for study, practice or assistance. Self-test ratings should be transmitted to the ranger district headquarters at the earliest opportunity (preferably by telephone) so that necessary assistance may be given without delay.

Test...by..District Ranger or Assistant

Practical problems simulating actual conditions will be used to test the fire guard's understanding of and ability to do the jobs for which he is responsible. The symbol "S" will indicate the guard is proficient in all jobs listed under each main heading. If the guard needs improvement in one or more jobs listed under a main heading, the symbol "N" will be entered after both the main heading and those specific jobs.

Hire of Fire Fighters

Fire fighters will usually be hired by a forest officer at the ranger district headquarters. If, in an emergency, the guard considers it necessary to hire men, he has authority to do so.

Note: Employment as a guard does <u>not</u> authorize one to draft fire fighters. Only forest officers holding appointments as <u>state fire wardens</u> or <u>state rangers</u> have this authority. Guards with these appointments should not attempt to draft men without specific instructions from the ranger.

Diary

Every guard is required to keep a daily diary of work and important occurrences. The large form "Daily Log and Dairy" will be used by guards who spend most of their time at their stations. Instructions for the use of this form are printed on the inside of the front cover.

Guards who are away from their stations much of the time (such as patrolmen) will keep a diary in the regular notebook.

R-6 F. C. Hdbk. Revised 2-15-44 No. 17 With the exception of data which must be recorded immediately, such as information concerning fires, automobile license numbers, or names of campers, the diary should be written each evening. The following should be included:

- 1. Time worked started and finished.
- 2. Method of travel and route taken.
- 3. Brief, concise record of work done and observations made.
- 4. Record of pertinent interviews and observations.
- 5. Record of forest officers' visits.

Personal Supplies

Each guard will usually subsist himself. Thirty days' food and other supplies should be ordered ahead of actual need, except where it is convenient to have deliveries made oftener in connection with other trips. Consult your ranger as to supplies needed.

Working Conditions

During the fire season, fires may start day or night seven days a week. Fires have no respect for the time of day or week. All members of the Forest Service, and especially members of the fire control organization, are expected to be available when needed if the valuable national forests are to be effectively protected. Fire is war; forces must be ready for any emergency at all times. Members of the forest protection organization gladly accept employment on that basis. The district ranger will specify detailed working conditions for each member of his organization, but in general, working conditions are as follows:

*(1) Work Week: The standard work week is 40 hours per week. The work week will consist of five 8-hour days a week. The days of the week may be staggered from time to time so as to obtain full coverage seven days a week. The employee can expect to be on duty any day of the week since fire conditions change from day to day and week to week. Hours will often be staggered during the day. In many cases a fire guard will work other hours than 8:00 a.m. to 5:00 p.m.

Those on lookouts will be given a check-look schedule which might run from dawn to dusk. The schedule will provide for off-duty time throughout the day; the total on-duty time will not ordinarily exceed 8 hours per day. Lookouts should refer to the Detection Chapter for details on "Check-Looks". Some prevention guards may need to be on duty during weekends with time off during the middle of the week. Those at ranger stations can expect to be requested to be on duty most any time in order to stagger dispatching and telephone service. *

Therefore, members of the fire control organization can expect to be scheduled to be on duty any day of the week or any hour of the day.

R-6 F. C. Hdbk. *Revised 5-2-47

- Service is actually working on assigned official work. A lookout may be looking for fires in accordance with his check-look schedule. A dispatcher may be in the ranger's office ready to take reports on fires. Any fire guard may be maintaining a trail or working on a fire. Or a fire guard such as a smokechaser or a member of a suppression crew, may have on his fire fighting clothes and be in readiness in a fire truck or tanker unit immediately ready to be sent to a fire.
- (3) On Call: When there is danger of fires, it is a tradition of the Forest Service that any member may be requested to be on call any time when he is not on duty. When on call, the employee, as requested, will be within hearing of a telephone, or within hearing distance of a prearranged signalling device (such as a fire siren), or where he can be quickly reached by a messenger. When on call, the employee is free to read, pitch horseshoes, listen to the radio, garden, swim, keep house, cook and eat meals, mend clothes, sleep, mow the lawn, play with chipmunks, study, carry on hobby work or otherwise do as he wishes. Members of the Forest Service can expect to be on call during evenings, holidays, week ends, during the day, or any time they are not on duty. An effort will be made to eliminate or stagger on-call time between the various employees when fire conditions are not critical.
- (4) Public Duties: As a member of a public service organization, any employee of the Forest Service can expect to, and should gladly, perform certain public services while not on duty. A forest visitor will stop and wish to know where the fishing is best, which road or trail to take, or he may wish a campfire permit or an entry permit. A member of the public may call on the telephone to ask a question or someone may call to have the telephone switched. A stockman or logger may stop a few minutes to chat. Fire weather information may be transmitted or a forecast received. These are the type of public services any fire guard can expect to take care of when he is not on duty.
- (5) Ordered Overtime for Fire Suppression: In case of an emergency involving life or property (such as a forest fire), the ranger may request any employee of the Forest Service to work or be on duty more than 40 hours *- per week. Employees occupying unallocated positions will be paid at their regular base hour rates for the excess hours. Employees occupying allocated positions may choose to take compensatory time for the excess hours. If they do not request compensatory time and their base salaries are \$4,045.00 per annum or less, they will be paid at their regular base hourly rates for the excess hours. Employees whose base salaries are in excess of \$4,045.00 per annum will be paid for the excess hours at the overtime rates established for their positions by the General Accounting Office (The overtime hourly rate for positions, the salary of which is in excess of \$4,045.00 is less than the base hourly rate.). Regardless of the position occupied (i.e., allocated or unallocated), all employees will be paid at their base hourly rates for the regular assigned hours when working on a holiday in connection with presuppression or fire-fighting work. In other words, if a person worked 8 hours, within his regular tour of duty, on a holiday, he would receive only the same pay he would have received if he had performed no work. -*

Most cases of ordered overtime will be for fire fighting (suppression or service of supply). This will include certain travel time as specified by law (the ranger will advise as to details), and actual working or on-duty time outside of the scheduled 40-hour work week. It will not include time taken for eating, resting or sleeping or of certain types of atravel. There are two very important items in connection with this, as follows:

- (a) The fire guard should keep a detailed and accurate diary of his time. He should specify when he worked and what he did and when he rested, ate, slept, periods of travel--when he left and arrived, etc. This is particularly important on small fires where the fire guard is keeping his time and the district guard, district ranger or other similar forest officer is not available to check and approve the on-duty time.
- (b) As a matter of pride and in order to maintain a high working morale, every member of the Forest Service will make a special effort to be very fair in keeping track of and turning in time which involves ordered overtime. Those who keep their own time are on their honor to be honest and fair. Whenever possible, the guard should have his time checked and approved by a superior forest officer who is familiar with the circumstances.
- (6) Emergencies Involving Regular Protection Activities: By staggering work hours, and days, most regular protection activities will be taken care of. Fire danger varies from day to day and seldom a week passes but there are one or more days when a part or all of the ranger's protective force can, and will, be given one to two or more days off to take accumulated annual leave or not be required to be on duty. In this manner, a guard should not have to work or be on duty over 40 hours per week. However, the guard may be requested to be on call and there will be no special provision for providing transportation to or from his station. Each fire guard will take pride in making a special attempt to complete his regularly assigned tasks within the 40-hour week. There will be occasions, particularly during the peak of the fire season or when there are continuous lightning storms, when for certain stations someone will need to be on duty more than 40 hours per week. When the ranger finds, as a last resort, that he cannot take care of unforeseen emergencies by staggering hours or days, or abandoning the station for a few hours or for a day or two a week, or take care of the situation by placing the occupant on call, the emergency can be met by:
- (a) Ordering the employee to work or be on duty overtime, i.e., beyond the scheduled 40-hour week.
- (b) Providing an alternate who might be the regular fire guard's wife or another guard selected and trained to fill the position for a few hours or a day or more at a time.

The guiding rule in connection with working conditions is that every forest officer should take pride in completing his assigned tasks within the 40-hour week.

Staying at Station

Except in emergencies, guards should <u>not</u> leave their stations without permission or instructions from the ranger, or one designated by him. Upon starting on or returning from a job or trip the guard should report to the ranger station.

Entire Page Amended 5-28-52 R-6 F. C. Hdbk. No. 69

Leave

Most guards will be entitled to annual leave accruing during their periods of employment, as provided in the Forest Service Manual. Information as to the amount may be obtained at the district ranger's office. No annual leave will be granted in advance. Leave will be taken during the fire season if, in the ranger's judgment, favorable weather permits. If not taken during the fire season, it will be allowed at the end of the season.

Work Other Than Fire Control

When not engaged in fire prevention and suppression activities, guards are expected to do other work assigned to them. The ranger will supply a job list showing the work to be done and give instructions, when necessary, how to do it. As jobs are completed, they should be checked off the list, showing date completed.

Since it is essential that guards be available in case of fire they should not be out of communication while engaged in other work, except under instructions from the ranger.

Special Equipment

Guards may be required to furnish a car, motorcycle, or pack and saddle animals. Such requirements are agreed upon at the time of hiring. Forege for animals will be supplied by the Government. Contracts will be prepared prior to entrance on duty.

Expenses for Official Travel

Where necessary for guards to use private vehicles for official travel, reimbursement for mileage will be allowed in accordance with travel regulations. Speedometer readings at the beginning and end of each trip, time of departure and arrival, and destination should be recorded.

Physical Condition

Every guard should be in good physical condition. This is essential not only for the best performance of strenuous work which is frequently required of him, but also to prevent a sudden physical breakdown or future impairment of good health. The guard should get some excercise each day and plenty of rest each night.

Supplement

The supplement is intended for those miscellaneous forms and in structions which may be changed from year to year and for special instructions to meet individual forest needs. Before the guard receives this chapter, the supplementary material will be added by the ranger.

*Some parts are included with the chapter; other parts are to be inserted by individual forests. $\underline{1}/$

Part

- 1. Guard Training Plan and Inspection Outline. (Form 87-R6, Sheets 1 to 6)
- 2. Legitimate and False Smoke Record (Form).
- 3. Guard's Job List (Form).
- 4. Minimum Equipment for Guard Stations (check list).
- 5. Field Clothes' Specifications for Guards.
- 6.
- *7. List of Forest Camps, showing those which are "Posted." 1
- *8. Instructions for Administration of Closures (show areas on guard's map).
- *8a. Guards Duties in Connection with Accidents or Disasters.
 - 8b. Care, Purchase and Preparation of Food.
- *9. Schedules for Lookouts (check-looks, water trips, and special patrol). 1/
- *10. Special instructions for individual stations or guards. 1/

DETECTION

Ran	ger I	Distr	ict				Guard Stat	ionaoi	Position		
Gua	rd	•••••					Numbe	er Seasons Experience			1 100-000-
					TRA	NING	PLAN	TEST REC	ORD		-
			OD (JCTI				*Subjects included in R-6 standardized guard training	Final proficiency test (4th step of instruction) to be	Guard' Self Tes Dates	st Test	
Needs Instruction	Guard Camp	On-the-Job Telephone/Radio Specific Self-Training		Specific Self-Training	Initials of Officer Responsible for Instruction	Date Instruction Completed	camp program for lookout firemen. **Additional guard training camp inst. given primary lookouts.	given on the job. Use Symbols: V—Satisfactory N—Needs Improvement (Check specific jobs)		Initials	
							1. Learn (Knowledge of) th	e Country			
*			42				ADJUST AND ORIENT FIRE F	INDER			
							2. Level fire finder				
							3. Check cross hairs—plum	sights			_
							4. Replace, orient map disk	(½" scale)			_
							5. Adjust distance tape			1000	_
							6. Check, orient fire finder				_
							7. Use mirror flash for orien	nting			_
*							8. Care of fire finder MAKE GENERAL OBSERVATION CHECK LOOKS FOR SMOKE	ONS AND SYSTEMATIC			-
							9. How to make general obs	observations			_
							10. How, when to make syste	ematic check looks			_
							11. Locate and record legitim	ate and false smokes			_
							12. Record strikes and check	for "sleeper" fires			_
							LOCATE AND REPORT FIRES				_
							13. Locate fire by local landn	narks			
							14. Use fire finder to determin	e azimuth and vertical angle			
		- 1					15. Estimate distance to fire				
							16. Locate fire on fire finder				
							17. Record data on lookout r on fire	eport form; phone in report			
							18. Use panoramic photos				
-,	k sk						19. Use supplemental detecti	on points			
							RECORD STATUS OF GOING	FIRE			
							20. Determine area of fire by 21. Keep chronological recor	d of fire on lookout report			
	*						form—report definite cha 22. SAFETY RULES DURING LIGH	ITNING STORMS 1 of Supp	ement	- Page	1
_	U !				1	1		R-6 F.C. Hdbk. Page amended 2	1- 111		-

Page amended 2-25-54

SMOKE CHASING

Ran	ger :	Distr	ict				Guard Station	P	osition			
Gua	rd	******	•••••				Number Seasons Experience	4000000	********		*******	
	M	ETH	OD		TRAI	ING	PLAN TEST 1	REC				
	INS	TRI	CT	ION			*Subjects included in R-6 Final proficiency test (4standardized guard training step of instruction) to h		Guard Self To Date	est	Rang Te Dat	st
Needs Instruction	Guard Camp	On-the-Job	Telephone/Radio	Specific Self-Training	Initials of Officer Responsible for Instruction	Date Instruction Completed	camp program for lookout firemen and firemen. Use Symbols: V—Satisfactory N—Needs Improveme	Use Symbols:	Date		Initi	
							RECORD FIRE REPORT ON L. O. FORMS AND LOCATE FIRE ON MAP					97
	*						1. Record fire report on lookout report form					
							2. Locate fire on fireman's map by local landmarks and legal description	1				
							3. Understand how to locate fire on panoramic photo					
H							KNOW COUNTRY AND PLAN ROUTE OF TRAVEL 4. Know location, name, condition of roads, trails and	-		-		
							other routes of travel					
							 Know location and use of section line boards, field markings, local—landmarks 					
	4						6. Determine azimuth and distance to fire from known point with protractor and scale	/n		•		
							MAINTAIN FIREMAN'S OUTFIT AND TRANSPORTATION READY FOR IMMEDIATE GET-AWAY TO FIRE				F = 1	
							7. Know get-away standards and policy on travel, day or night					
	*						8. Inspect, maintain fireman's outfit, according to fores standards	it				
							9. Keep transportation, car, horses, ready for use.					
							USE BEST SUITED METHODS TO FIND FIRE					
			34				10. Measure distance by pacing					
							11. Use compass in running lines, turning angles					
							12. Orient self with compass, protractor and map	\parallel		\dashv		
	4						13. Correlate map and ground location					
	ab.						14. Get on lookout line of sight			-		
					!		15. Locate fire from known point			-		
							16. Plot and use 2 point intersection					
	*						17. Use offset method					
							18. Gridiron for fire					
							19. Arrange and use direction signals with lookout					
	*						20. Climb tree to see above surrounding timber-smell sm	oke				
						12.5	21. MARK POINT OF DEPARTURE FROM RORE TRAJET SU		ement	-11	Pag	e 2
					1		R=6 F.C. Hdb					

Page amended 2-25-54

SUPPRESSION—SMALL FIRES

Ran	ger 1	Distr	ict	•••••	•••••		Guard Stat	ionJ	Position	••••••
Gua	rd	••••	•••••				Numbe	er Seasons Experience		
					TRA	ININ	G PLAN	TEST REC		
		ETH STRI					*Subjects included in R-6 standardized guard training	Final proficiency test (4th step of instruction) to be	Guard's Self Test Dates	Ranger's Test Dates
Needs Instruction	Guard Camp	On-the-Job	Telephone/Radio	Specific Self-Training	Initials of Officer Responsible for Instruction	Initials of Officer Responsible for Instruction Date Instruction Completed	camp program for all inex- perienced guards.	given on the job. Use Symbols: V—Satisfactory N—Needs Improvement (Check specific jobs)		Initials
							KNOW POLICIES IN FIRE SL	JPPRESSION		
						T.	1. Action to be taken on all	fires		71
			1				2. Policy on night travel, w	ork		
						- 1/	3. Policy on staying with fir	e		
		4. Policy on checking fires before abandoning		pefore abandoning						
		SIZE UP FIRE PLAN ATTACK AND DETERMINE CAUSE								
							5. Determine danger points	where fire is likely to spread		
							6. Look for and preserve evidence if man-caused fire			
							USE BEST SUITED METHODS TO SUPPRESS FIRE			
		1					7. Attack fire on most dangerous points			
							8. Throw clean dirt			
							9. Build control line			
							10. Use water			
					L H		11. Burn out			
							12. Fall snags (be able to fall without help)	32" snag with axe or Pulaski		
							13. Search for and suppress s	pot fires		
						1	MOP UP FIRE			
							14. Recognize danger of dela	y in mop-up	R	
							15. Use dirt			
							16. Use water			
							17. Use "boneyard" system	(preferred method)		
	-						ASSEMBLE DATA FOR FIRE RI	EPORT (929)		
							18. Understand "fireman inst	ructions for 929"		
							19. Determine timber type an	d fuel type		
							20. Determine percent of slop	ne		
					10_		21. Measure burned acreage			
							22. Fill in fireman's portion o	f Form 989rt 1 of Supp	Lement	Pare 3
			4					R-6 F.C. Hdbk.	- 111-	1

Page amended 2-25-54 No. 81

lang	ger I	Distr	ic t				Guard Stat	ionl	Positi	on		
lua	rd	•					Numbe	r Seasons Experience				
	747	CONTY	0 D	0.77	TRA	ININ	PLAN	TEST REC			-	
	INS	ETH TRU	CT	OF			*Subjects included in R-6 standardized guard training	Final proficiency test (4th step of instruction) to be	Self Da	rd's Test tes	Rang Te Dat	st
Needs Instruction	Guard Camp	On-the-Job	Telephone/Radio	Specific Self-Training	Initials of Officer Responsible for Instruction	Date Instruction Completed	camp program for all inex- perienced guards.	given on the job. Use Symbols: V—Satisfactory N—Needs Improvement (Check specific jobs)			Init	ials
							Know Names and Location Other Forest Users	n of Loggers, Stockmen and				
						-	FURNISH INFORMATION AND ENLIST COOPERATION	ASSISTANCE TO THE PUBLIC				
							2. Observe desirable public	contact practices				
		3. Maintain presentable personal appearance										
			4. Maintain presentable station appearance									
							5. Give information on forest resorts, lakes, streams, pe	t roads, trails, campgrounds, aks	s,			
							6. Give information on fores	at resources				
							7. Make use of printed fire	ted fire prevention material				
							8. Secure cooperation in proper use of campgrounds					
							9. Explain or demonstrate h guish camp fires	ow to build and extin-				
							10. Educate public in fire pre	vention				
							SECURE COOPERATION AND LAWS AND REGULATIONS	OBSERVANCE OF FIRE				
							11. Issue camp fire permits- ing thereto	explain regulations pertain-				
							12. Issue registration certific	ates				
							13. Issue entry permits					
							14. Post and maintain closure of authority	es—administer within limits				
							15. Know applicable State ar	d Federal fire laws				
							16. Take authorized action o Federal fire laws	n violations of State and				
							17. Search for and preserve e	vidence in fire law violations				
							18. Secure signed statements	from witnesses				
\dashv												
								Part 1 of Sup	,,,,,,,	- 10#	D	

lua	rd						Numbe	r Seasons Experience				
							PLAN	TEST REC				
		ETH STRU					*Subjects included in R-6 standardized guard training	Final proficiency test (4th step of instruction) to be	Guard's Self Test Dates	Rang Te	est	
Needs Instruction	Guard Camp	On-the-Job	Telephone/Radio	Specific Self-Training	Specific Self-Training	Initials of Officer Responsible for Instruction	Date Instruction Completed	camp program for all inex- perienced guards.	given on the job. Use Symbols: √—Satisfactory N—Needs Improvement (Check specific jobs)		Init	ials
					715		Plans and Accomplishes As with Standards	signed Work in Accordance				
							2. Understand District and F 3. Understands Fire Fighting Standards					
					11/1/1		MAINTAIN EQUIPMENT AND	QUARTERS				
							4. Wood and Water Supply-	-Fire Protection				
							5. Follow rules governing occ Sanitation					
							6. Keep windows clean					
							7. Understands how to close	station				
	-						ESTABLISH AND MAINTAIN C	COMMUNICATION				
						MA	8. Connect telephone to line	and ground				
-			14.7				9. Connect telephone batteri	es			1	
							10. Maintain telephone lightni	ng protection				
Ì						+	11. Diagnose, repair common t	celephone troubles		HP		
		: .					12. Set up, maintain radio					
							13. Operate radio using approv	ved practice				
							OPERATE FIRE DANGER STATI	ON				
							14. Fuel sticks and scales					
					7		15. Wind gauge and vane					
				- 2			16. Psychrometer					
			18	Ų.			17. Rain gauge					
							18. Visibility meter					
		1		1			19. Ocular estimation of visib	ility		411		
							20. Keep records				H	
					1091		21. Understands policy on firear	ms				
		40					22. Understands policy regarding	g game violation				
240	*						23. Knows and observes applica 24. ACCOMPLISHES SELF TRAINING	G (See General Instruc-				

Sheet 6

Guard Training Plan and Record For 19......

DISPATCHING

Gua	rd				•••••••		Number \$	Seasons Experience				
	***	-	0.5		TRAIN	NING	PLAN	TEST RE				
		TRU						'inal proficiency test (4th tep of instruction) to be	Self	rd's Test tes		ger's est
Needs Instruction	Camp	-Job	Telephone/Radio	aining	Initials of Officer Responsible for Instruction	Date Instruction Completed		given on the job. Jse Symbols: V—Satisfactory N—Needs Improvement			Init	
Needs	Guard Camp	On-the-Job	Teleph	Specific Self-Training	Initials Respon Instruc	Date In Comple		(Check specific jobs)				
							ADVANCE PREPARATION					
							1 Knowledge of district	ğ	1			
							 Knowledge of fire and dispate Appraise training needs of presented 	rotective org.				
							(Use Guard Training Plan as					
-							4. Train guards on the job and 5. Assist with, and check on guards	* *				
							6. Check on guard's knowledge of applicable safety rules 7. Train available organized crews					
							8. Train cooperators					
							EXECUTE STRENGTH-OF-FORCE PLANS					
							9. Maintain Fire-Danger Ratin	g System				
	<u> </u>						10. Currently check fire organiz	ation				
							11. Currently check communica 12. Currently check condition as Service-cooperator fire equi	nd readiness of Forest				
							13. Keep dispatching equipment for action					
							ACTION ON SMALL FIRES					
			_				14. Receive and plot lookout's re	ept. on single fire				
-			_		11		15. Obtain and plot cross shots	on single fire	-			
_							16. Receive reports and plot gro	oup fires	-			
							17. Uses panoramic photographs	S	1			
			_				18. Determine responsibility for					
-							19. Instruct and dispatch one or					-
						-	20. Instruct and dispatch one or					-
			_	-			21. Train assistant to help plot 22. Take follow-up action on go				1	
							23. Take action to check "out"					
							24. Use dispatching check list	Part 1 of Sup R-6 F. C. Hdb	pLeme	nt	Pa	ge 6

(Continued on reverse side) age amended 2-25-54

T	RAINING	PLAN	TEST REC	CORD	
METHOD OF INSTRUCTION			Final proficiency test (4th	Guard's	Ranger's
MISTROCTION			step of instruction) to be	Self Test Dates	Test Dates
, o	1 g		given on the job.	Dates	~ 400
Guard Camp On-the-Job Telephone/Radio Specific Sulf-Training	Initials of Offices Responsible for Instruction Date Instruction Completed		Use Symbols:]	
Guard Camp On-the-Job Telephone/Rad Specific	of of sible stion		V—Satisfactory N—Needs Improvement		Initials
the eph	tials pour truc truc nple		(Check specific jobs)		
Gu On Spe	Initials of Officer Responsible for Instruction Date Instruction Completed				
		ACTION ON LARGE FIRES			
		25. Establish communication	with fire boss		
		26. Use fire plan in supplying equipment as requested	fire boss with men and		
		 Furnish fire boss with per plan of area if available 	tinent maps and fire control		
		28. Keep chronological record	of all action taken		
		 Secure progress reports or other sources. Keep Sup. 	n fire from lookouts and Office informed		
		 Keep close check on balan other large fires from deve 	ce of district to prevent		
		RECORDS ON GOING FIRES			
		31. Use of Form 2-R6			
		32. Use of wall map for showing of fires	ng location, size and status		
		33. Use of three basket system	n		
		34. Complete Form 929 fire re	port		
		35. Understand and follow F.	F. financial policy		
		36. Rent fire equipment			
		7. Hire fire fighters			
t L of Supple	ment -	Page 6a			
e amended 2-2	25-54	AGR-8C3-PORTLAND, ORE SEPT 1953		1	

Ranger	Dist		St	tation	Position			
Guard		and the second		Number Seasons For	rmer Exp			
Sea	son-	Long	Training Plan	Test Reco	ord			
ymbols or I ymbols	of Instr.	C - R - I - G -	Training Symbols Competent Review (problems) Initial instruction Us	inal proficiency test 4th step of instruction 5 be given on the job. 6 Symbols: 6-Satisfactory	Guard's	Ranger's Test Dates		
Use S C. R. Use S G.T.O	Date Initi	T - 0 - ST -	Telephone " N On the job " (Self Training	N-Needs Improvement (Check specific jobs)		Initials		
			KNOW POLICIES IN FIRE	SUPPRESSION				
		1.	Action to be taken on	all fires				
		2.	Policy on night travel	l, work				
		3.	Policy on staying with	n fire				
		4.	Policy on checking fir SIZE UP FIRE TO PLAN A CAUSE					
		5.	Determine points where spread	e fire is likely to				
		6.	Look for and preserve caused fire	evidence if man-				
			USE BEST SUITED METHOD	OS TO SUPPRESS FIRE				
		7.	Attack fire on priorit	ty of danger points				
		8.	Throw dirt					
		9.	Use water					
		1,0.	Build control line					
		11.	Cold trail					
	- M		Burn out Fall snags (be able to saw or Pulaski without					
		14.	Search for and suppres	ss spot fires				
			MOP UP FIRE					
		15.	Use dirt					
			Use water					
		17.	Use "boneyard" system	(preferred method)				
		18.	Use "graveyard" system	m				
		19.	Recognize danger of de	elev in mon-up				
			ASSEMBLE DATA FOR FIRE	E REPORT (929)				
		20.	Understand "fireman in					
		21.	Determine timber type					
		22.	Determine percent of slope					
		23.	Measure burned acreage					
		24.	Fill in fireman's port	tion of Form 929				

Part 1 of Supplement - Sheet 7 R-6 F.C. Handbook, Part II - Chapter 9 Amended December 1942

LEGITIMATE AND FALSE SMOKE RECORD

Enter following data for all objects that may look like smoke under certain conditions.

Twn.	Range	Sec.	Subdiv.	Azimuth	Vert. Angle	Description of False Smoke
	_					
-						

						·
			-			
j						
		1				

GUARD'S JOB LIST

Name	Station	
	Forest	
Priority	Jobs to Do	Date Completed
	to a contract of the second of	

R-6 F.C. Hdbk.
Part 3 of Supplement
Part II Chapter 9
Page Revised 2-21-45
No. 24

MINIMUM EQUIPMENT FOR GUARD STATIONS

(For use in checking, inventorying, preparing a	and fillin	g order	rs)
	Teat of the late	Extra	Selected
	All	for	Stations
Equipment	Stations	1&LF	Only_
*-Forms			
Campfire Permits (Form 26-R6)	10	Up to Elli	EUEXY IV
Fire Fighter's Contract (Form 106-R6)	6		0.00
Time Slips (Fire) (Form FS-874-15A)	5		West -
Fireman's Fire Report (Form R6-F26)	6 5 2 2		1月 50 夏九
Individual Fire Reports (Form 929)	2	DE LA	
Lookout Reports (Form 1-R6)	10	20	Taken a
Care of Tools and Equipment (Form 424)	1		
Humidity Table	T A LINE		1
Occupancy of Field Quarters (Form 96a)	1	(Lbf 162	1518H
Property Notice (Form 244)	1		HETER
Telephone Call Card	1		Long's
U. S. Weather Bureau Form 1009 E-*	intal Glass		1 pad
		THE PERSON NAMED IN	phylas.
		COLL STA	
Instructions			
Guard's Job List	1		
Check Look and Water Schedule		1	
State Fire Laws	2971		112
General Instructions to Fire Guards (II-9,F.C.H)	1	Eg Ha	
Detection (II-6, F.C.H.)		1	
Smokechasing (II-8, F.C.H.)	1		1
Fire Fighting (III-1, F.C.H.)	1	111-11	
Other F.C.H. Chapters for selected guards.			
Fire Fighting Overhead Notebook (for selected	The Miles	E 11	Mean
guards)			TO AND THE REAL PROPERTY.
Horsepacking, instructions (for selected guards)	7 10 6 10 10 10		
Snagfalling, instructions (for selected guards)			
	derde are	71, 1 Km	
Maps			
Fireman's Map	1		
Forest Recreation Folder $(\frac{1}{4}")$	1		
State Road Map			1
U.S.F.S. Quadrangle Sheets for Territory (if			
available)			
0.00:		100	
Office Supplies			
Carbon Paper, Notebook size	3		100
Carrying Case (Ranger's) or map case	1		10.30
Diary (Notebook of Daily Log)	1		
Notebook Poneil Block	1 2		
Pencil, Black	2	7	9 6 5 1 5 1 5 1
Pencil, Red	170 6	1	And the

Part 4 of Supplement - Page 1 F.C. Hdbk.
Part II - Chap. 9
*Amended 7-10-53
No. 76

MINIMUM EQUIPMENT FOR GUARD STATE	ONS (Cont	d)	
		Extra	Selected
P - 1 1	All	for	Stations
Equipment Equipment	Stations	L&LF	Only
Lookout Equipment Clock, Alarm		1	
Flashlight or Electric Lantern		i	
Glasses, Colored		1	
Extra Horsehairs for Sights		12	
Level		1	
Mirror, for Flashing		1	
Oil for Fire Finder		1	
Pliers, Slip Joint Screw Driver		1	
Stool, Insulated Legs		1 1	
Vaseline for Fire Finder		i	
Window Cleaner		1	
Wrenches for fire finder, open end		2	
, ,			
			1
M. walani Garani			
Household Supplies	1		
Basin, Wash Board, Wash	1		
Broom	i		
Bunk or Cot	1		
Can or Water Bag for Packing Water			1
Chimney for Lamp (extra)	1		
Chloride of Lime	1		
Kerosene or Gasoline, Gallons	1		
Lamp or Lantern	1 2		
Mantles, gas lantern (extra) Mattress	î		
Packboard, for Packing Water	_		1
Pail, Water	1		
Stool or Chair	1		
Stove	1		
Stove Polish	1		
Table	1		
Tub, Wash	1		
Water Bag, 2-gallon Wicks, Lamp (extra)	1		
wicks, namp (excra)			
		1	
•			And the state of t
t.			
			an englishmen
Part 4 of Supplement - Page 2			
F.C. Hdbk.			
Part II - Chap. 9			
Revised 4/28/48, No. 44			

MINIMUM EQUIPMENT FOR GUARD S Equipment	All Stations	Extra for L&LF	Selected Stations Only
Mess Outfit, 3-man or 6-man (FCEH)	1		
Fire Equipment Panoramic Photographs (set) with scale Smokechaser Outfit (complete)	1		
Tools, Improvement Axes Files Hammer, Carpenter Saw, Bucking Saw, Hand Saw Handles Shovel, L.H. Sledge Wedge Whetstone Wrench, Crescent, 10" or 12"	1 2 1 1 2 1 1 1 1		
Other Equipment Badge, Forest Guard First Aid Kit, No. 1 Flag and Rope Fuel Moisture Indicator Sticks Key (if needed) Nails, Assorted (pounds) Oil, Mineral (pint) Paint Brush Paint, color of building (as needed) Paint, red, small can Psychrometer and extra wicking Rain Gauge and Rule Wind Gauge	1 1 2 1 1		1 1 1 1 .
Part 4 of Supplement - Page 3 F.C. Hdbk. Part II - Chap. 9 Revised 4/28/48, No. 44			

FIELD CLOTHES SPECIFICATIONS FOR GUARDS

Coat, Trousers, Breeches: *-Material to be of 14- or 16-ounce all-wool forestry green whipcord--American Woolen Company, Color No. 168.-*

Goat: Half-Norfolk-three-button, single breasted, notched collar, loose fitting yoke on back and front, belt 2 inches wide partly stitched on (to belt loops or as otherwise specified) and placed below natural waistline. Two straps, 1-3/4 inches wide in front and back extending from bottom of yoke to bottom of coat. Back without vent. Two side patch pockets 8 inches wide and 8½ inches deep, fitted with flaps 2-3/4 inches wide. Inside pocket, right breast. Outside slip pocket, left breast opening under strap. Coat may be *-half-* lined or full lined; for light-weight materials full lining preferable. Body lining to be of good quality mohair, alpaca, sateen, or celanese of proper shade. Sleeve linings, canvas, and other trimmings to be of good quality.

. Optional features -- Full Norfolk, no yoke on back and front, with straps extending over the shoulders.

Trousers: *-Medium full straight cut with or without 1-3/4 inch cuff. Two side and two hip pockets, and one watch pocket. Hip pockets with tabs to button. Six belt loops for 1½-inch belt. Flap and suspender buttons of bone-suspender buttons on inside. Pockets to be made of very durable pocketing; other trimmings to be of good quality. Fly to be equipped with zipper unless purchaser specifically orders buttons.-*

Breeches: *-Medium or full cut in thighs, laced or buttoned in side seams from about 2 inches below the knee to the bottom just above ankle.

Knee strapping of leather or same material as breeches, to extend well over the kneecap from the inseam to the outseam and far enough above and below the knee to give ample protection. Two quarter top pockets and one watch pocket. Two hip pockets, one to button. Six belt loops for larinch belt. Flap and suspender buttons of bone, suspender buttons on inside. Pockets to be made of very durable pocketing; other trimmings to be of good quality. Fly to be equipped with zipper unless purchaser specifically orders buttons.-*

Cossack Jacket: The Cossack type of jacket is optional (instead of the Norfolk coat). *** The Cossack jacket must be made of the forestry green whipcord of the same material and color as the trousers. Two types optional—one with zipper front and side pleats at back or one made without the side pleats at back.

Buttons: The plain bone button without the Pine Tree and without the "Forest Service" is standard for all guard uniforms. A green button to match material should be used.

Part 5 of Supplement - Page 1 R6 F.C. Hdbk. Part II - Chap. 9 *Amended and ***Deleted 7-10-53 No. 76 Hats: *-Stetson--brim 2-5/8 inch is regular $(2\frac{1}{2})$ inch optional for short men); depth of crown $5\frac{1}{2}$ inches; color Belgian belly, hemlock green band and cord; raw edge; regular or oval shapes.

Knox--brim 2-7/8 inch, lighter weight, or 2-3/ μ inch brim, heavier weight. Depth of crown $5\frac{1}{2}$ inches, color aspen (brownish-green), bound edge; regular or long oval shapes.-*

Badge: *-The "Pine Tree" badge to be worn on the left breast on either the shirt or coat pocket.-* The badge should never be worn on the belt.

Shirts: Color--*-light olive gray green.-*

Style--Collar attached; 2 breast pockets with flaps to button; no shoulder straps.

Material—Plain material without figures or pattern, of poplin, broadcloth, serge, khaki, tropical worsted or flannel.

Ties: Style--Four-in-hand only; bow ties not permitted.

Color-Dark green, plain, no figures, no other colors or mixtures.

Material -- Optional in Barathea silk, knitted silk or woven woolen.

Footwear: Boots--Choice of high laced; stiff-topped; woodsman's; Service (laced side and instep).

Color--Dark tan or Cordovan.

Shoes--(with trousers) tan or Cordovan. ***

Slickers or Raincoats: Materials—Alligator, oilskins, rubber, cravenette, trench coat.

Color--Forestry or dark green.

-Sweater: Heavy- or light-duty forestry green.-

INSTRUCTIONS FOR ADMINISTRATION OF CLOSURES U. S. Forest Service - Region 6

A. Classes of Closures or Restrictions

1. Absolute Closures (Very limited in number - extreme high hazard areas):

(a) These areas are closed to all public entry or use.

(b) Authority for Closure: Regulation T-1(I); Section 107-210, Oregon Forest Laws.

(c) Use: No use is allowed except that necessary to protect the area from fire and trespass.

2. Permit Closure (Hazardous areas, mostly snag-infested burns and cutover areas with slash):

(a) Closed to all public entry except by permit.

(b) Authority for closure: Regulation T-1(I); Section 200, Washington Forestry Laws; Section 107-210, Oregon Forest Laws.

(c) Use: All regular forest users, as loggers, construction workers, miners, residents, and stockmen, will be issued permits for specific areas and for carrying on their regular business, but not for recreation purposes. Those of the general public desiring to use the area for such purposes as fishing, hunting, and camping are to be excluded.

Applications for permits should be taken on Form 108-R6 after which the permit card, Form 107-R6, will be prepared and issued to the applicant, who should have it in his possession while in the closed area. The permittee and the forest officer will both sign the permit card. In Oregon, The State permit, Form 26, can be used instead of Forest Service forms for private lands, but it is not necessary to use it. Specific use cases are described as follows:

- (1) Permits to prospectors and miners: All miners working in a mine operation or on a located claim of record should be permitted to carry on mining work on the operating area. Prospectors with a staked claim, or who wish to work a definite area of about a claim size, should be given a permit to work only as prospectors on the area described. For commonlyknown and recognized mineralized zones or areas, permits may be issued for larger areas of about a section in size. A definite area should be described in the permit. Prospectors who wish to roam far and wide without a definite detailed area in mind should not be given permits by forest guards; the issuance of any such permits will be decided by the District Ranger or the Forest Supervisor.
- (2) Permits to Residents (settlers): Residents with their families (who can be described as ranchers, farmers, or people more or less permanently located or having a residence in the area) cannot be required to have a permit under the Federal regulation to work and live on land owned or rented, or to go to or from their homes. If the matter is properly presented it is hoped most people will voluntarily apply for permits so they can be more

easily identified and checked and not be confused with those not having business in the area. Under the Oregon law, residents can be required to have permits. Under the Washington law, permanent residents have the right of access, but they can be required to have permits if so stipulated in the closure notice.

- (3) Permits to loggers: Loggers and persons engaged in other regular business, and their families residing in the area, may be required to have permits under the Federal regulation and the Oregon law. In Washington permits can be required if so stipulated in the closure notices. It is essential that employers as well as employees be definitely advised that the closure regulations do not permit the pursuit of other than regular business. Appropriate notices to this effect could be posted on bulletin boards at such places as logging camps.
- (4) Permits to visitors: Permits to visitors to visit or to carry on temporary business with residents, loggers, guards or other forest officers, or others having permits and living in or using the closed area should be restricted to groups or classes of people as doctors, mail carriers, industrial insurance inspectors, labor union officials, law enforcement officers, social workers, relatives, and those delivering necessary supplies. Guards, forest officers, and all permittees should not be permitted to fish or hunt in the closed area. Forests may find it practical to arrange for local residents to utilize reasonably safe spots at specified periods to pick berries when a guard is available to be in attendance. All groups and individuals must be treated alike in administrative closures. Adjoining forests should correlate other administrative features.
- (5) Restrictions: Restrictions as to place and use should be covered in detail on the back of each permit. Special attention should be given to defining restrictions. The place should be described as to the exact working or living unit, as a logging operation or camp, a grazing allotment, a mine, or a legal land subdivision, and the route to be traveled to and from the unit. Use should specify the business or purpose, any smoking restrictions, and that recreational pursuits, as fishing, are not permitted. Under Federal regulations on national forest lands, and Washington Section 200 on all lands, use can be restricted to daylight hours if considered necessary.
 - (6) Time: If an applicant will need to use the closure continuously, or nearly so, for the entire fire season, any permit issued should be for the period from the date of issuance until the closure is terminated. For other than season-long use the period or periods should be indicated. Periodic use of short duration should be covered by separate permits. Noneffective permit cards need not be turned in, but a request can be made for their return if desired and it is convenient for permittees to return them.

- 3. Registration Closures: (Rarely used to include heavily-used large recreational areas of considerable hazard):
 - (a) Closed to all public use except by registration.
- (b) Authority for closure: Regulation T-1(M); Section 200, Washington; Section 107-210, Oregon. (In Oregon registration and the issuance of a registration certificate becomes in effect a permit, and should be considered so by forest officers, as the Oregon law does not provide for registration. If any question arises as to the status of certificates, the words "and permit" can be written under the title "Registration Certificate." Legally, permit and registration closures are alike under the Oregon law, but they are administrated differently through classification of forest users and the issuance of permits or certificates. The Oregon permit Form 26 can be used if desired, but it is not necessary to do so.)
- (c) Use: All persons applying to enter and use a registration closure will be registered on Form 109-R6 and the original of the registration certificate given to the registrant. Each member of a party over 12 years old should be required to register. Organized groups wishing to enter an area may, as desired, be registered as a group, provided they will remain together as such while in the area. Campfire permits will also be necessary for those who are to camp where such permits are required. Certificates for season-long use may be issued to those who use the area rather continuously or periodically for regular business and are in the same status as those issued permits to enter or use permit areas. Otherwise certificates should be issued to occasional users for a specific time for each entry. The registrant should retain his copy of the certificate while within the closed area. If desirable, night travel may be prohibited by notation on the registration certificate above the forest officer's signature. It is not necessary for certificates to be returned after they have expired, but they can be requested if desirable and it is convenient for the registrant to do so. If a guard is stationed at an entrance to the closed area, it would be desirable to have all non-effective certificates returned when the registrants leave the area.
- l. Three-Rule Restriction (All lands inside the national forest boundary and, in some cases, protected lands outside the national forest boundary:)
- (a) Building a campfire without a permit, smoking while traveling, and being in the area with intention to camp, without specified fire tools are prohibited. (For details and exceptions, refer to pages 5 to 7 in this chapter and to the back of Form 26-R6, Camp Fire Permit.)

(b) Authority for restriction: Regulation T-1(E), T-1(H), and *T-1(N); Sections 110 and 200, Washington; Section 107-210, Oregon.

(c) Use: Applicable rules apply to all persons entering or using the restricted areas.

B. General Instructions:

Posters: All closed areas should be posted in accordance with the ranger district poster plan with consideration given to fully informing forest users and travelers, as well as to comply with the law. Most closure violations can be avoided if the areas are adequately posted.

Part 8 of Supplement - Page 3 R-6 F.C. Hdbk., Part II, Chap. 9 *Revised 4-3-52 No. 67 In Washington, mimeographed copies of State notices for all classes of closures must be posted. They may be attached underneath Forest Service posters.

If poster boards are scarce, posters placed in interior areas, not on roads, may be lightly tacked to trees. Maps, either base maps $(\frac{1}{4})$ or photostatic reductions) or plain skeletonized maps showing closed areas with informative legend should be pasted on the posters, notices, or signboards, at all entrances used by the public. Information should also be available at each entrance as to where permits or registration certificates can be obtained. A special effort should be made to inform and educate people by all means available so closure violations can be prevented. *

Posters should be promptly removed once a closure is terminated.

Prevention: When forest users are issued permits or registration certificates, they should be instructed as to fire prevention restrictions and what to do if a fire is observed. The occasion is unusually valuable to obtain support for the fire prevention program if contacts are definitely planned in advance.

Law Enforcement: Those trespassing in closed areas without permission or who are not adhering to prescribed restrictions should be promptly apprehended and interviewed. Those who, without question, are innocently trespassing should be treated with discretion by responsible forest officers. * Those trespassing knowingly should receive no leniency. If trespassers are suspected of sabotage or criminal intentions, prompt arrest and legal action are essential. Regular local law officers should be consulted and their aid obtained in all flagrant trespass cases. Part I, Chapter 3 of the Fire Control Handbook should be referred to for details on law enforcement procedure.

*GUARD'S DUTIES IN CONNECTION WITH ACCIDENTS OR DISASTERS

Forest officers are always expected to assist in case of disaster to the extent of their resources, keeping in mind, however, that during the fire season the protective organization must be interfered with as little as possible.

*A. ACCIDENTS AND DISASTERS INVOLVING AIRCRAFT

The following policy will govern forest guards who may find it necessary to take action in connection with aircraft crashes or forced landings.

1. Airplane Wrecks

- *(a) Take immediate steps necessary for the safety and relief of personnel. <u>Caution</u>: Remember and apply indicated first aid procedures temporary splinting of fractures before moving; proper handling, particularly in skull, spine and back injuries; avoid any moving or handling not absolutely necessary in the circumstances. If aircraft is burned, position of bodies is important to authorities in identification.
- (b) Control and extinguish fire, if any, using standard fire fighting methods.
- *(c) Take immediate steps to protect the plane or any parts of it or its contents from being disturbed pending the arrival of investigating personnel. Do not disturb the plane yourself or permit others to do so. Crashed airplanes are highly combustible. Don't smoke near the plane if there is a possibility of setting fire to the crash by so doing. Watch for and do not touch explosives, flares, or other incendiary materials.
- *(d) Immediately phone or send word to your ranger district headquarters, giving all information regarding the crash which you have: Location, type of plane and its condition, personnel and their condition, and time and circumstances of crash if known
- *(e) Do not give local publicity except as necessary to notify your ranger district headquarters.
- *(f) Permit your district ranger or other authorities to take charge when they arrive.
- (g) Make diary notes of all pertinent facts, including names and addresses of witnesses, if any.

2. Recording Airplane Flights

- (a) All lookouts and lookout-firemen when on duty should look for and make a record of all airplanes seen or heard in flight over forest areas. The record should be made in the Daily Log and Diary.
- (b) A record should be made of the time of day; number of planes; single or multi-motor; high, mid-, or low-wing; type of tail surface; direction seen or heard; and direction of travel
- *(c) If a plane in flight makes 4 or 5 tight or short circles over a small area, a record should be made of the azimuth and distance from the lookout and the approximate township, range, and section. This information should be immediately transmitted to your ranger district head-quarters as the plane may be circling over a small fire. Certain lookouts will also have standby radios to listen for and receive reports on fires

- located by aircraft. Any reports received should be transmitted to your dispatcher.
- B. ACCIDENTS OR DISASTERS NOT INVOLVING AIRCRAFT (Lost persons, automobile accidents, etc.)
- 1. Offer immediate help or advice where there is danger to life, health or property.
- 2. Notify your ranger district headquarters of circumstances and follow directions given you. If the ranger headquarters cannot be reached follow your best judgment. Usually those involved in accidents not involving danger to life or health will make their own arrangements for relief. In the event of major accidents such as drowning, serious injury, etc., every assistance should be given until the persons are able to organize and direct the necessary relief operations themselves.
- 3. Always make telephone facilities available to individuals in these situations, assuming, of course, that they will arrange for payment of any commercial charge.
- *-C. ENEMY AIRCRAFT ACTIVITY (Parachutists, objects dropped from aircraft, crashed aircraft) Reporting procedure:
 - 1. Designated Ground Observer Stations. Report to Filter Center through established channels.
 - 2. All other stations and individuals. Report to District Ranger who will immediately relay report direct to Filter Center.
 - 3. After report to Filter Center notify Forest Supervisor who will advise Regional Office of incident and action taken.-*

CARE, PURCHASE, AND PREPARATION OF FOOD

Purpose

This material on foods has been compiled for forest guards to use in caring for and purchasing food supplies in advance for guard stations far from a grocery store, to insure balanced healthful meals through weekly menus, and to provide a depository for recipes needed to cook the foods included in the menus and market lists. The simple menus are based on three meals as a unit, and are made up of a minimum number of plain dishes, so preparation of meals will be easy. Obviously, omitting or substituting foods should be viewed critically to be sure that the same food values are kept.

	Tal	ble	of	2 (or	nte	ent	ts											Page
Household Suggestions a	and	Co	oki	ing	z F	lir	nts	3.		0		0	0	0	•	0		0	2
Market Orders	0	0 0	0	0	0			0	٥	0	•	0	0	0			•		6
Menus for Two Weeks	0		0	0						0.	0	0	0			0			10
Recipes:																			
Baked Dishes																			12
Beverages																			13
Breads																			14
Cakes and Icings																			15
Cereals																			16
Cookies																			17
Eggs																			18
Meat, Fish and Chees																			19
Gravies and Sauce																			22
Pies																			23
Puddings																			24
Sauces																			25
Salads																			26
Dressings																			27
Soups and Chowders.																			27
Vegetables.																			29

Note: Valuable material was furnished from Region One, U. S. Forest Service; Home Economics Department, Oregon State College; and Home Demonstration Agents, Extension Service, Oregon State College.

Household Suggestions and Cooking Hints

Eliminating Nuisance from Ants, Flies, and Mice:

- Ants Remove source of attraction usually some sweet substance spilled on shelves and on outside of syrup pitcher or jam jar. Scrub shelves and drawers with strong soap. Keep outside of syrup and jam containers clean by frequent washing. Place lumps of gum camphor in the ants? runway.
- Flies- Keep interior of kitchen clean all leftovers covered and stored in cupboard. Remove outside attractions. Keep garbage covered latrine flyproof.
- Mice Destroy with mousetraps. Keep cereal, flour, cheese, etc. in covered coffee cans or other mouseproof containers. Make food storage compartment mouseproof by covering all holes with tin. Keep matches in mouseproof container.

Care of Dishes and Utensils:

Dishes and cooking utensils should be thoroughly washed and then scalded with boiling water before drying. The amount of water used for rinsing can be greatly reduced and the same results obtained by adding a little vinegar to the water. Vinegar, being an acid, neutralizes the soap.

Vegetable Storage:

Potatoes, turnips, rutabagas, beets, carrots, and parsnips keep best in a cool, moist place. Winter onions keep best where it is cool and dry. Construction of a root cellar or pit at isolated stations would be desirable for storage of root vegetables. Vegetables placed in a pit require protection from rodents, and this can be accomplished by first placing them in a rodentproof screen box.

Cooking Vegetables

Potatoes

To get the most from your potatoes, cook them in their jackets. When you must peel, keep peelings thin. Prized minerals lie close beneath the surface.

Root Vegetables

When cooking vegetables, cover those that grow under the ground and leave uncovered those that grow above the ground.

Start root vegetables in boiling salted water, about 1 teaspoon of salt to a quart of water. Young, tender roots need only enough water to prevent them from sticking to the pan; older roots enough boiling water to cover.

Part 8b of Supplement - Page 2 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14 To keep flavor of onions and turnips mild, leave kettle uncovered. To speed the cooking of others, put on the lid.

Boil root vegetables whole in their skins unless too strong or tough. Nature grew this jacket to hold in food value and flavor. If peel you must, make peelings thin, or scrape no more than skin deep.

Carrots, turnips, onions often cook more quickly if sliced or diced. Serve in their own juice or, if too much, use in soup, sauce, or gravy to make the most of minerals, vitamins, and flavor.

Green Vegetables

Food Value: Green leaves are rich in minerals and vitamins, especially iron and vitamins A and C. Some are rich in calcium. They are also a good source of B₁ and G. The thinner and greener the leaf, the higher its value for iron and vitamin A. Get the habit of serving a leafy green vegetable every day. Beet tops, Swiss chard, endive, and spinach are favorites, but don't overlook the wild greensdandelion, mustard, dock, and others.

<u>Preparation and Cooking:</u> Wash greens carefully, use two bowls of water, and wash only a few at a time, lifting carefully out of the water to prevent sand clinging to the leaves.

Cook all greens <u>quickly</u> and in a <u>small quantity of water</u> to preserve flavor and food values. Cook only until tender.

Panning is a quick and easy way to cook greens, especially those with a pungent flavor, such as mustard greens, turnip tops, kale, and many of the wild greens. Melt some fat in skillet, add chopped greens, cover skillet to keep in steam and cook slowly about 15 minutes or until tender. Sprinkle in a little flour, mix it well with greens and then pour in some milk or cream and stir until thickened. Season with salt and pepper and serve at once.

Dried Beans or Peas

First of all, pick over the beans or peas and throw out all bad ones. Wash in cold water, twice if need be, to get out all grit. Give dried beans and peas plenty of time to soak, overnight or 5 or 6 hours.

Use soft water, if you can, when you soak and cook beans. Hard water toughens the skin. Old-time cooks caught rain water when they couldn't get soft water for their beans any other way.

Cook them in the water in which they are soaked to save vitamins and minerals. If bean flavor seems too strong, you may have to drain them and add fresh water. Don't add soda, or you will lose some of the vitamins.

Part 8b of Supplement - Page 3 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14 Keep the heat low as you cook beans and peas, and simmer instead of boil. Watch the pot, too. Add water from time to time. Dried beans and peas take up a lot of water as they cook.

Miscellaneous Hints

If soup is too salty, add slices of raw potatoes. Boil and remove.

Do not put macaroni or rice in cold water and allow to start cooking, because they will stick. Use boiling water at the start.

Grease inside edge of top of kettle when cooking fruit or candy, and it will not boil over.

Add 1 tablespoon vinegar or lemon juice to one cup of either canned milk or fresh milk, to make sour milk.

Canned milk is diluted in proper proportion by adding an equal amount of water.

Before heating milk in saucepan, rinse pan in hot water and it will not scorch so easily.

When baking bread, cookies, biscuits, etc., put a dish of water in the oven to prevent scorching.

If oven does not have a temperature gauge, put either bread or white paper in oven. If it turns brown quickly, oven is too hot for most things; if it turns brown in about 5 minutes, then oven is moderately hot.

Prevent cheese from moulding by wrapping in a cloth wrung out of vinegar. Then roll in paper.

An old ham can be made to taste good by first trimming off all of the outside and parboiling in solution of 1 teaspoonful of soda and $\frac{1}{2}$ cup vinegar to a quart of water. Old bacon can be treated in similar manner.

Butter will keep indefinitely by submerging in a strong brine (salt) solution, preferably in sealed fruit jars. Keep in a cool place.

Eggs will keep fairly fresh for an indefinite period by submerging in a solution called "water glass", a commercial product, which can be purchased at any drug store. It comes in powdered form and the cost is little.

Measuring Stick for Your Meals

An adult's daily meals should contain:

1. One pint of milk (fresh, diluted from can, or powdered), either as a beverage or as a part of soup, sauce, main dish, hot cakes, on cereals, desserts, etc.

Part 8b of Supplement - Page 4 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

- 2. At least 2 generous servings of green vegetables, such as carrots, lettuce, onions, sauerkraut, spinach, string beans, and tomatoes. Whenever raw vegetables are available, they should be eaten in abundance.
- 3. One potato a day for its iron content and alkalinity.
- 4. One serving of fruit.
- 5. Meat, fish, or a substitute such as a cheese or egg dish.
- 6. An egg 3 or 4 times a week.
- 7. For energy breads, starchy vegetables, cereals, desserts, butter, etc., to complete the menus.
- 8. Plenty of water.

Part 8b of Supplement - Page 5 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Market Orders

The amounts estimated below (Column 2) are based on the requirements of one person for one month, as this is the unit most frequently used. When ordering for more than one person, multiply the indicated amounts by the number of persons for whom rations are required and list in Column 3. In addition, allowance should be made to provide for meals for occasional visitors. Form 3-R6 is a convenient order form and can be secured from the District Ranger.

5-10 18 a convenient order form and can		:Quantity : Total
		:Required : amount
		:1 person :required
		:1 month :one month
Staple Supplies		(Col. 2) (Col. 3)
Cereals and flour:		
The new cream of wheat (enriched)	14 oz. pkg.	4 02.
Cracked wheat	1 lb.4oz.bag	
Rolled oats	1 lb.4oz.bag	3 oz.
Enriched flour (white)	lbs.	2 lbs.
Whole wheat flour	lbs.	1 1b.
Prepared hot cake flour	1 lb.12oz.pkg	. 1 lb.
Egg noodles	5 oz. pkg.	
Crackers, soda	1 1b. pkg.	½ pkg.
Rice, brown	2 lb. pkg.	
Macaroni	8 oz. pkg.	
Cornmeal	1 lb.8oz.bag	
Legumes and corn:		
Dried navy beans	lbs.	$\frac{1}{2}$ 1b.
Dried split peas	lbs.	4 02.
Dried lima beans	lbs.	$\frac{1}{2}$ lb.
Peanut butter	8 oz. jar	8 02.
Dried corn or	8 oz. pkgs.	2 pkgs.
Canned corn	#2 can	2 cans
Canned meats and fish:		
Canned beef (or fresh beef chuck)	12 oz. can	2 cans
Spam or Prem	12 oz. can	1 can
Corned beef	12 oz. can	1 can
Tuna fish	7 oz. can	1 can
Chile con carne	#2 can	1 can
Dried or cured meats and fish:		
Dried beef	lbs.	4 oz.
Dried codfish	lbs.	2 oz.
Salt pork	lbs.	1 lb.
Bacon	lbs.	2 lbs.
Ham	lbs.	1 lb.

Part 8b of Supplement - Page 6 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

```
Smallest : Quantity : Total
                                              : Purchasing : Required : amount
                                                            :1 person :required
                                                   Unit
                                                            :1 month :one month
                                                  (Size)
                                                              (Col. 2) (Col. 3)
                                                 (Col. 1)
Canned vegetables and fruits:
   Vegetables - Sauerkraut
                                              jar or can
                                                              1 pt.
                 Spinach
                                              15 oz. can
                                                              1 can
                 Beets
                                              #2 can
                                                              1 can
                 String beans
                                              #2 can
                                                              1 can
                                                              3 cans
                 Canned tomatoes
                                              #2 can
                                              #2 can
                 Peas
                                                              1 can
                 Mushrooms
                                              7 oz. can
                                                              1 can
   Fruits - (none unless dried fruits not available)
      Canned grapefruit juice
                                              #2 can
                                                              2 cans
Dried fruits:
   Raisins
                                              15 oz. pkg.
                                                              l oz.
   Apples - Dried
                                              lb.
                                                              7 oz.
            Canned
                                              #2 can
                                                              2 cans
                                                              ± 1b.
   Prunes - Dried
                                              lb.
            Canned
                                              #2 can
                                                             1 can
                                                             1/3 1b.
                                              lb.
   Peaches - Dried
                                              #2 can
                                                              1 can
              Canned
   Dates
                                              lb.
                                                              를 1b.
   Powdered lemon juice
                                              8 oz. pkg.
                                                              2 oz.
Preserves:
                                              lb. jar
                                                              1 lb.
   Jam
                                              8 oz. jar
                                                              8 oz.
   Jelly
                                              8 oz. jar
                                                              8 oz.
   Honey
Condensed canned soups:
   Tomato soup
                                              10 oz. can
                                                              2 cans
Beverages:
                                              ½ lb. pkg.
                                                             ½ lb.
   Cocoa
                                                             1 lb.
                                              lb.
   Coffee
   Tea
                                              1 lb. pkg.
                                                             1 lb.
Milk:
                                              14 oz. can
                                                             16 cans
   Canned
   Dried (If powdered milk is substituted
      for some of the canned milk, estimate
      3\frac{1}{2} oz. of powdered milk and 1\frac{1}{2} oz.
      butter as equivalent for 1 142-oz. can)
```

Part 8b of Supplement - Page 7 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

```
: Smallest : Quantity : Total
                                           : Purchasing : Required : amount
                                                Unit
                                                       :1 person :required
                                               (Size) :1 month : one month
                                              (Col. 1) (Col. 2) (Col. 3)
  Cheese:
                                                          1 1b.
     American cheese
                                           lb.
  Salad Dressing:
                                                          를 pt.
     Mayonnaise
                                           ½ pt. jar
     French dressing
                                           ½ pt. jar
  Sugar and syrups:
     Sugar, granulated
                                           lbs.
                                                          3 lb.
                                           lbs.
     Sugar, brown
                                                          1 1b.
     Syrup
                                           pt. jar
                                                          1 pt.
  Seasonings and condiments:
     Salt (Leslie's Iodized)
                                           2 lb. pkg.
                                                        * 1 pkg.
     Pepper
                                           4 oz. pkg.
                                                         * 4 oz.
      Cinnamon
                                           2 oz. pkg.
                                                         * 2 oz.
                                                         * 2 oz.
     Nutmeg
                                           2 oz. pkg.
                                           2 oz. bottle
                                                         * 2 oz.
     Vanilla
     Mustard
                                           2 oz. jar
                                                         * 2 oz.
                                           pt. bottle
                                                         * 1 pt.
     Vinegar
     Pickles
                                                         * 1 pt.
                                           pt. jar
     Mapleine
                                           1 oz. bottle * 1 oz.
      Paprika
                                           l oz. can
                                                         * 1 oz.
                                           small bulb
      Garlic
                                                         * 1 bulb
  Miscellaneous:
                                           8 oz. pkg.
      Cornstarch
                                                          l oz.
      Jello - strawberry or orange
                                           34 oz. pkg.
                                                          1 pkg.
      Gingerbread mix
                                           142-oz. pkg.
                                                          l pkg.
                                           8 oz. pkg.
                                                          l oz.
      Tapioca
      Butterscotch pudding mix
                                           4= oz. pkg.
                                                          1 pkg.
      Baking powder
                                           8 oz. pkg.
                                                          3 oz.
      Soda
                                           き lb. pkg.
                                                          3 oz.
Perishable Food Order
   Bread
      Enriched white
                                           lb. loaf
                                                       2 loaves
                                                        2 loaves
      Whole wheat
                                           lb. loaf
         (Biscuits, muffins, cornbread, in addition to loaf bread
          given above, but more bread should be obtained if lunches
          are to be carried for work away from the guard station)
```

* Col. 2 indicates 3 months' supply - 1 person.

Part 8b of Supplement - Page 8 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

	ALL REAL PROPERTY.	
	: Purchasing : Unit : (Size)	:Quantity: Total :required: amount :l person: required :l month: one month
Butter or fortified margarine	(Col. 1)	(Col. 2) (Col. 3) 2 lbs.
Eggs	dozen	l ¹ / ₂ dozen
Fruit Lemons Oranges	dozen dozen	1/6 dozen dozen
Meat (fresh) Weiners	lb.	½ lb.
Shortening	lb.	2 lbs.
Vegetables		
Cabbage	lb.	2 lbs.
Onions	lb.	1 1b.
Potatoes	lb.	10 lbs.
Rutabagas or Carrots	lb.	2 lbs.
iscellaneous		
Matches	box	2 boxes
Soap, Laundry	bar	l bar
Scouring Powder	can	1 can
Toilet	bar	2 bars
*Measuring cup		1 cup
*Measuring spoons		l set
9		

^{*} The purchase of an inexpensive graduated measuring cup and set of measuring spoons and bowl covers will greatly add to your success in cooking and conserving food.

1 set

Part 8b of Supplement - Page 9 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

*Transparent bowl covers

Menus For Two Weeks

(Please note: Menus do not need to be followed in sequence if there is left-over food which should be eaten the next day. They merely suggest a variety of foods and indicate how a balanced diet can be obtained.)

(First Week)

THE RESIDENCE OF THE PARTY OF T		(First Week)	
Breakfast	:	Lunch	: Dinner (Supper)
Orange	:	Deviled eggs	: Beef stew (canned beef)
Hot cakes - Bacon		anut butter sandwich	:with dumplings and gravy
Syrup	:	Milk	: (Potatoes, onions,
Coffee - Milk	(0	dried reconstructed)	: rutabagas in stew)
	:		: Cocoa Pudding
Grapefruit juice	:Toas	sted cheese sandwich	s: Hash
(canned)	:		:(left-over meat and pota
Oatmeal - Toast(enrich	ned	Cocoa	: from Sunday)
bread)	:		: Fried Egg
Jam	:		: Cole slaw
Coffee - Milk	:		: Apple pie (dried apple
Stewed prunes	:		: Wieners - Sauerkraut
Whole wheat muffins	:	Corn chowder	: Baked potato
Jam	:	Toast	: Brown betty
Coffee - Milk	;	Tea	: (dried apples)
	:		:Lemonade (powdered lemon
	:		: juice)
Orange	: Ton		: Macaroni and cheese
French toast - bacon		Cole slaw	111111111111111111111111111111111111111
Syrup	:Toas		s: (mashed and buttered)
Coffee - Milk	:	Jam	: Baked custard
The state of the s			Tea
Cracked wheat with	:	Stewed dried corn	: Fried ham
raisins - milk	: _	(with milk)	: Baked potato
Apple sauce	: Toa	ast Lemonade	
Toast	:	Honey	: Baking powder biscuits
Coffee - Milk			: Stewed dried peaches
Orange	:		: Creamed dried codfish
Cream of Wheat		Tried egg sandwich	on .
with dates	:	Jelly sandwich	: Boiled potatoes
Coffee	:	Cocoa	: Boiled fresh cabbage
Left-over baking powde			:Orange or strawberry jel
biscuits(reheated in c	ven)		: with peaches (left over
Stewed prunes	. m.	atad shaar sand	: Pork and beans
Fried eggs and			:Beets(canned, fresh or dr
(left-over)fried potat	oes	Apple sauce	: Rice Pudding : Lemonade
Toast			Lemonade
Coffee - Milk	:	and the second s	

Part 8b of Supplement - Page 10 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

p	-				-			. 1
1	C	0	0	-	na	141	ee.	10
1	N	U	C	U	IIu	8.6	CE.	1 1

Breakfast	Lunch	Dinner (Supper)
Orange Hot cakes — syrup Bacon Coffee — Milk	Bean soup Crackers or bread	: Fried spam : Baked potatoes :String beans(canned or dried : Gingerbread : (commercial mix) : Apple sauce : Coffee
Grapefruit juice Cream of wheat with dates Whole wheat muffins Coffee - Milk	: Toasted spam sandwich : Stewed dried fruit :	
Grapefruit juice Milk Toast Jam Coffee	:Scrambled eggs and bacon : Bread : Lemonade :	: Vegetable chowder : (grated cheese on top) : Corn bread Cole slaw : Butterscotch pudding : (package mix)
Stewed wild huckleberrie (if available) Cream of wheat Toast Jam Coffee - Milk	es: Creamed lima beans Cole slaw Bread Lemonade	<pre>: Dried beef gravy on : Boiled potatoes : Wilted greens (wild) :(or canned or dried spinach) : Dutch apple cake</pre>
Orange Fried mush (left-over cream of whee Syrup Toast Coffee - Milk Orange Oatmeal and raisins	Tea : : : : : : : : Split pea soup :Peanut butter and jelly	: (left-over potatoes) : Poached egg : Stewed tomatoes :Huckleberry pie(if available) :or Apple pie (dried apples) : Creamed tuna fish on rice
Toast Coffee - Milk	sandwiches	: Canned beets : Apple tapioca pudding : Lemonade
Apple sauce Toasted cornbread (left over) Coffee - Milk	:Sauted corn beef on bread : : Stewed prunes :	d: Spanish rice : Canned peas :Chocolate bread pudding

Part 8b of Supplement - Page 11 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14 Recipes - Unless otherwise specified, all recipes are for 2 or 3 servings.

Baked Dishes

Baconized Corn and Macaroni

1 cup macaroni $\frac{1}{2}$ cup canned corn 1/8 teaspoon pepper 3/4 cup white sauce (medium) $\frac{1}{2}$ teaspoon salt 3 slices bacon

Cook the macaroni until tender in plenty of salted boiling water. Drain. Add seasoning, corn and cooked macaroni to white sauce. Pour in baking dish and over top lay the bacon cut in squares. Bake 15 minutes or until bacon is crisp.

Baked Dish

l small potato l small onion $\frac{1}{2}$ can tomato soup $\frac{1}{2}$ lb. ground round steak l stalk celery(if available) salt & pepper to taste.

Alternate layers of potato, ground steak, onion, and celery until baking dish is filled. Pour over tomato soup. Grated cheese may be added on top if desired. Bake one hour at 350 degrees (moderate oven).

Hunter's Lunch

l small can mushrooms sauted $\frac{1}{4}$ lb. bacon $\frac{1}{2}$ cup lima beans $\frac{1}{2}$ onion $\frac{1}{2}$ cup cooked spaghetti $\frac{1}{2}$ cup corn, whole $\frac{1}{4}$ lb. ham in $\frac{1}{2}$ " strips $\frac{1}{4}$ cup canned tomatoes kernel

Fry together mushrooms, onion, ham, and bacon until done. Mix with all other ingredients and bake $\frac{1}{2}$ hour at 350 degrees (moderate oven).

Macaroni and Cheese

 $\frac{1}{2}$ package macaroni $\frac{1}{4}$ teaspoon salt $\frac{1}{2}$ cup milk (if canned, dilute $\frac{1}{2}$ 2 tablespoons butter dash pepper with water) $\frac{1}{2}$ cup finely-cut cheese

Cook macaroni in 3 cups boiling water with 1 teaspoon salt until tender. Drain. Melt butter, add flour and seasonings and blend thoroughly. Pour in milk and stir until thick and smooth; cook for a few minutes longer and add cheese and stir until it is melted. Put macaroni and cheese sauce in layers in baking pan having sauce on top. A little diced ham may be sprinkled over this. Bake in medium oven till brown.

Part 8b of Supplement - Page 12 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Meat Pie

l can beef stew
l cup flour
2 teaspoons baking powder
l small onion cut fine
1 teaspoon salt
2 tablespoons butter

Place beef stew, onion, and butter in pan and cook about 15 minutes. Make biscuit dough using flour, salt, baking powder, and shortening. Mix well, using finger tips, then add enough milk, a small amount at a time, to make a soft dough. Pat out to about 1 inch in depth and cut into small biscuits. Place close together on top of meat mixture. Bake in hot oven about 20 minutes or until biscuits are browned. Any small amounts of left-over vegetables such as carrots, string beans, peas may be added to the stew mixture. Also left-over meat, such as ham, roast beef and even fried bacon can be cut in small pieces and added.

Spanish Rice

 $\frac{1}{2}$ cup uncooked rice 2 cups tomatoes 1 teaspoon salt 1 can chopped roast beef 2 large onions $\frac{1}{4}$ teaspoon pepper

Cook rice in salt water till soft. Cook onions, which have been sliced thin, in a greased frying pan; when onions turn yellow, add roast beef, which has been chopped. Cook together about 20 minutes. Add cooked rice and tomatoes. Season and stir well. Pour mixture in pan, add a little water, cover, and bake in a moderate oven about $\frac{1}{2}$ hour.

Beverages

Hot Chocolate

Cut small square unsweetened chocolate in small pieces. Place chocolate in pan and pour over enough hot water to melt. Add dash salt and 3 teaspoons sugar and mix with chocolate. Add one cup of warm water and boil 4 minutes, stirring constantly to prevent burning. Add $\frac{1}{4}$ cup of evaporated milk with $\frac{1}{2}$ cup of warm water and stir. Do not boil after adding milk.

Coffee

3 cups water $\frac{1}{4}$ cup coffee pinch of salt

Place coffee in pot. Add boiling water. Bring to a full boil, then simmer 3 to 5 minutes until desired strength and color are reached. Add salt and 1 to 2 tablespoons cold water to help settle coffee.

Tea

Put a pinch of tea, more or less, according to taste, into boiling water and set to one side to steep for 5 to 10 minutes, until it is the desired strength. Do not boil.

Part 8b of Supplement - Page 13 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Breads

Baking Powder Biscuits (6 to 8, 2" in diameter)

1 cup sifted flour 2 teaspoons baking powder 1/3 cup milk (if teaspoon salt (scant) $1\frac{1}{2}$ tablespoons shortening canned, dilute $\frac{1}{2}$ with water)

Sift dry ingredients. Work in shortening with fingers until like very coarse corn meal. Add liquid all at once and stir quickly until mixture thickens. Place dough on lightly floured board and pat out $\frac{1}{2}$ " thick. Cut with floured cutter, and place biscuits in a baking pan. Bake in hot oven 12 to 15 minutes.

Corn Bread

1 egg $\frac{1}{2}$ cup flour 2 teaspoons baking 2 tablespoons sugar $\frac{1}{2}$ cup corn meal powder 1 tablespoon melted shortening 3/4 cup sweet milk (if canned, dilute $\frac{1}{2}$ with water)

Mix and sift dry ingredients. Then add milk and egg mixed together. Combine the two mixtures mixing well, then add shortening, and pour in well-greased pan and bake until done.

Hot Cakes

l cup flour

l egg
l teaspoon salt
l teaspoon sugar

l tup milk (if canned, $\frac{1}{2}$ teaspoons baking
l tablespoon sugar

dilute $\frac{1}{2}$ with water)

(Sour milk with 1 teaspoon

soda may be substituted

for sweet milk and baking powder)

First mix all of the dry ingredients together; then add items as they appear on list. If sour milk and soda are used, dissolve soda in a little hot water before adding to the mixture. Stir real well and bake on griddle or in frying pan.

Muffins

 $\frac{1}{4}$ cup shortening 2 cups flour 1 cup milk (if canned, $\frac{1}{4}$ cup sugar 3 teaspoons baking powder 1 cup raisins 1 cup raisins

Beat sugar and shortening to cream consistency. Break egg into mixture and mix. Sift together flour, baking powder, and salt and add alternately with milk to shortening-sugar-egg mixture. Stir only enough to mix well or they will become tough. Cut raisins into batter, then place in greased muffin pans.

Part 8b of Supplement - Page 14 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Cinnamon Toast

½ cup sugar ½ teaspoon cinnamon

Old bread

Mix sugar and cinnamon together, toast bread quickly so it won't dry. Butter generously. Sprinkle sugar and cinnamon mixture on top and set in hot oven for a minute.

French Toast

1 egg $\frac{1}{2}$ cup water $\frac{1}{2}$ cup canned milk seasoning (salt)

Beat egg, add water and milk. Into this, dip slices of dry bread and fry them in hot grease. Serve with maple syrup or jam.

Hot Maple Sauce (for hotcakes)

cup water 2 cups brown sugar (white sugar carmelized)

4 teaspoon mapleine

Boil together water and sugar until it reaches soft-ball stage when a drip is dropped in cold water. Remove from heat and add flavoring.

Cakes and Icings

Plain Cake

l cup white sugar

cup shortening or butter 3 eggs (separated)

3/4 cup milk (if canned,

dilute = with water)

1 teaspoon salt 2 cups flour 1 teaspoon vanilla 2 teaspoons baking powder

Cream sugar and shortening; add egg yolks which have been beaten lightly; add a small quantity of milk and flour alternately until all has been used up; add vanilla and finally stiffly-beaten egg whites to which the salt has been added. Bake in two layer pans or baking pan, which has been slightly greased and floured, for 15 minutes. Test with a toothpick; bake until none sticks to the toothpick. Cover with boiled or fudge icing.

Spice Cake

 $\frac{1}{2}$ cup shortening 1-3/4 cups flour 1 cup sugar

1-3/4 teaspoons baking powder

专 cup milk (if canned, dilute ½ with water)

1 teaspoon cinnamon (other spices 2 eggs may be used if desirable)

Cream sugar and shortening. Add eggs and beat well. Sift flour, baking powder, spices, and add alternately with milk. Beat well and bake about 30 minutes in a moderate oven.

Part 8b of supplement - Page 15 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Fudge Icing (or Creamy White Icing)

2 cups sugar 3/4 cup canned milk 1 teaspoon vanilla 4 tablespoons cocoa 1 rounded teaspoon butter

Mix sugar and cocoa, add milk. Place on stove and stir until sugar is dissolved. Let boil until a few drops from the spoon dropped in cold water form a soft ball. Add butter. Remove from stove and let cool. Do not move pan while cooling or mixture will become sugary. When outside of pan is cool, add vanilla and beat until creamy. Spread on cake. (Omit the cocoa and you will have creamy white icing. Be very sure to cool before beating to insure creamy icing.)

Peanut Butter Icing

Mix together and beat an equal amount of peanut butter and strained honey. (Excellent with corn bread.)

Cereals

Cracked Wheat (serves 3 to 4)

l cup cracked wheat 5 cups water $l^{\frac{1}{2}}$ teaspoon salt

Add salt to boiling water. Add cracked wheat and stir until thickened. Cook over direct heat one-half hour, stirring frequently or cook in double boiler or equivalent one hour without stirring.

Corn Meal Mush

1/2 cup corn meal 2 cups water or milk (or 1 cup water and 1 cup canned milk)

Add salt to boiling water or milk. Add corn meal and stir until thickened. Cook over direct heat $\frac{1}{2}$ hour, stirring frequently, or cook in double boiler or equivalent 1 hour without stirring.

Rolled Oats

l cup rolled oats $2\frac{1}{2}$ cups boiling water or milk l teaspoon salt (or $1\frac{1}{2}$ cups water and l cup canned milk)

Add salt to boiling water or milk. Add rolled oats and stir until thickened. Cook over direct heat $\frac{1}{2}$ hour, stirring frequently, or cook in double boiler or equivalent 1 hour without stirring.

Part 8b of Supplement - Page 16 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Cookies

Fruit Cookies

1 cup sugar
3/4 cup shortening (creamed)
2 eggs

3 cups flour
3/4 cup milk (if canned,
 dilute ½ with water)

l teaspoon baking powder
l level teaspoon

Cream sugar and shortening. Add eggs. Sift flour, soda, and baking powder together. Add alternately with milk to sugar-shortening-egg mixture, stirring well between each addition. Roll out very thin on floured board and cut in desired size. Prepare fruit filling and place a small amount of the filling on top of one cooky. Wet edges of bottom cooky and place another cooky on top of this. Be sure to press sides of cookies together to hold filling in. Bake in a moderate oven until nicely browned.

Fruit Filling:

l cup cooked, dried apricots, sweetened l cup raisins cut in small pieces

teaspoon cinnamon

Add enough water to above ingredients to start the mixture cooking. Stir often and when as thick as jam, remove from stove. Cool.

Oatmeal Cookies

1 cup sugar 3 tablespoons melted bacon grease or other shortening

l tablespoon dry eggs (or l fresh egg)

1 teaspoon soda dissolved in 3/4 cup sour milk

l teaspoon cinnamon

l teaspoon vanilla ½ teaspoon salt l cup raisins 2 cups flour l½ cups oatmeal

Gream sugar and shortening. Add egg and mix well together. Sift flour, salt and cinnamon, and add alternately with sour milk, stirring well after each addition. Add oatmeal and raisins. Add vanilla. Drop off spoon on greased pans and bake until done, about 15 minutes.

Sugar Cookies

1/3 cup shortening $\frac{1}{2}$ teaspoon vanilla $\frac{1}{4}$ teaspoon salt 1/3 cup granulated sugar 2 cups flour 1 teaspoon baking powder 1 egg

Cream shortening, adding sugar gradually. Add eggs, vanilla and mix. Sift flour together with salt and baking powder, and add. Add enough milk to make a dough which does not stick to rolling pin. Set aside for a short time, then roll out to about 1/8" thick on a floured board. (A can with the entire top removed makes a good cooky cutter.) Flour the can to prevent sticking. Bake in greased pan, brush with milk and sprinkle with sugar. Bake in hot oven for 10 minutes.

Part 8b of Supplement - Page 17 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Fried Eggs

Heat fat in frying pan to moderate temperature. Avoid causing fat to smoke. Slip eggs carefully into pan and fry very slowly until done. Eggs must never be fried fast in a smoking hot pan, as they will be tough and hard.

Fried Eggs with Bacon

Place thinly sliced strips of bacon in a frying pan over low heat. Turn frequently and drain excess fat. When bacon is brown, remove to a hot platter. Drain excess fat and save for frying and seasoning. Slip eggs carefully into moderately heated pan. Add a tablespoon of water and cover. The steam helps to form a coating over the yolk. Cook very slowly.

Plain Omelet

3 eggs

salt and pepper 1 tablespoon butter

Beat eggs just enough to mix whites and yolks, and add salt and pepper. Heat butter in frying pan, pour a little of it into beaten eggs and allow remainder to get hot. Turn eggs into pan and as mixture cooks on bottom and sides, prick it with a fork so that egg on top will penetrate cooked surface, and run under edges. The work must be done quickly and carefully so that eggs are not all stirred up like scrambled eggs. While eggs are still soft, but slightly thickened, fold over, let stand a few minutes to brown and turn onto a hot dish.

Variations of Plain Omelet

For variations of the plain omelet, add the following, allowing one tablespoon of mixture to each two eggs used:

Ham or Other Meat or Cheese

Scatter finely chopped meat or cheese over center of omelet while it is cooking. The meat may be improved by browning in a small amount of fat before it is added.

Jelly

Spread any jelly or jam over omelet just before folding.

Part 8b of Supplement - Page 18 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Scrambled Eggs

2 eggs $\frac{1}{4}$ teaspoon salt

2 tablespoons milk or water 1 teaspoon butter or shortening

Beat eggs with egg beater or fork in a bowl. Add milk, salt, and mix. Heat fat in frying pan to moderate temperature. Avoid causing fat to smoke. Place egg mixture in pan. Stir frequently and cook slowly until coagulated enough to hold together but still moist and shiny in appearance. May be also scrambled in double boiler.

Meat, Fish, and Cheese Dishes

Boiled Meat

Place meat in kettle and cover with cold water. Bring to boil. Keep meat well covered and boil until tender. Resulting broth used for soups and stews.

Fried Meat (Steak)

Heat frying pan until very hot. Place steak in pan and stir around to grease pan. Sear quickly, first one side, then other. After searing, reduce heat under pan and cook slowly, turning steak every few seconds.

Roast Meat

Melt small amount of suet in a roasting pan placed on top of stove. Brown both surfaces of roast in hot suet, cover, and place in moderate oven. When about half done, season with salt and pepper. Baste frequently until done.

Beef and Peas

Ghop fine the contents of one small can of roast beef. Place chopped beef in a frying pan and cook about 20 minutes, then add 1 small can of drained peas. Season with salt and pepper, and cook about 10 minutes longer, then add a teaspoon of butter. Stir well and serve.

Corned Beef Hash

 $\frac{1}{2}$ cup chopped canned corn beef 1 cup chopped cooked potatoes

2 tablespoons chopped onion

2 tablespoons milk or water

l tablespoon fat

Mix beef, potatoes, onion, and milk or water and season to taste. Melt fat in frying pan, put mixture in, and cook slowly until brown on bottom. With pancake turner, fold over like an omelet. A poached or fried egg may be served on the hash.

Part 8b of Supplement - Page 19 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Creamed Dried Beef

1 cup milk (if canned, 1/16 teaspoon pepper 2 tablespoons butter dilute ½ with water) About 6 slices dried beef 2 tablespoons flour teaspoon salt

Melt butter in saucepan and stir in flour. Place over low heat and gradually stir in milk. Stir until mixture boils and thickens. Add salt and pepper. Cut or break beef into 2-inch pieces and add to mixture. Heat over low fire 10 minutes, stirring frequently. Serve over hot bread, toast, potatoes, boiled rice or macaroni.

Beef Mulligan

l can roast beef (cut up real fine) 1 can each of peas, corn, tomatoes, string beans 2 good-sized potatoes (sliced)

Mix all together and cook thoroughly.

2 small onions

1 teaspoon salt, pepper, catsup

1 tablespoon butter

Beef Stew

1 lb. stew beef cut in pieces of size for serving 1/3 cup flour 1 teaspoon salt 2 tablespoons fat 1/8 teaspoon pepper l quart boiling water

2 medium carrots 3 medium onions

3 medium potatoes

Wipe meat with cloth, add pepper and salt to flour on a plate and dredge meat with seasoned flour. Heat fat in frying pan and fry meat a few minutes to sear it. Turn and brown all sides. Sprinkle any extra flour over meat while searing. Boil water in saucepan, add meat and cover pan. Cook slowly until meat is tender, about $2\frac{1}{2}$ hours at sea level. About hour before meat is done, wash vegetables, cut into large pieces and add to stew. Add potatoes 10 minutes later than carrots and onions. Add boiling water when necessary to keep stew from burning. If desired, add dumplings 15 minutes before serving.

Dumplings

1 cup sifted flour $\frac{1}{2}$ teaspoon salt $\frac{1}{2}$ cup milk (if canned, 2 teaspoons baking powder $\frac{1}{2}$ teaspoon shortening dilute $\frac{1}{2}$ with water)

Mix and sift flour, baking powder and salt. Cut in fat with 2 knives, or work in with tips of fingers. Add milk all at once and stir quickly to make a soft dough. Drop by small tablespoonfuls on top of stew. Be sure stew has considerable boiling broth before adding dumplings. Cover pan and cook for 12 minutes or until done.

Part 8b of Supplement - Page 20 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Chile Con Carne and Noodles

Boil $\frac{1}{2}$ package egg noodles until tender. Heat contents of small can of chile con carne. Drain noodles. Pour over them hot chile. Serve hot.

Creamed Codfish

Separate the fish into very small pieces and leave in cold water for 3 hours, changing the water 3 times. Heat the milk, preferably in double boiler. Add the codfish, well drained, and cook 10 minutes. Mix butter with flour until smooth paste is formed, then stir it into the milk. Take dish from heat, add beaten egg, stir well, and add without further cooking. Sprinkle with pepper just before serving.

Italian Ham (4 servings)

l lb. sliced ham 4 small peeled onions $\frac{1}{2}$ pint canned tomatoes pepper

Cut ham 1" thick. Put in covered frying or roasting pan. Slice onions over ham. Add tomatoes, a generous sprinkling of pepper, and $\frac{1}{2}$ cup of water. Cover and bake one hour in moderate oven, remove ham to platter and make a gravy of the tomato juice and drippings, adding a tablespoon of flour with a little water to a cupful of gravy.

Meat Balls

Mix $\frac{1}{2}$ lb. ground meat with one thick slice of dampened bread. Add 2 tablespoons of finely chopped onion. Add one egg and season with salt and pepper. Form into round cakes about 1" thick. Fry in hot pan. Serve with gravy if desired.

Mulligan Stew (Bacon or Ham)

l qt. boiling water $\frac{1}{4}$ lb. bacon or smoked ham 3 onions 2 potatoes $\frac{1}{2}$ teaspoons salt 1 No. 2 can peas or green beans or both

Boil water and add salt. Cut potatoes into 1" pieces. Wash rice several times. Boil together. Dice bacon or ham into ½-inch pieces and fry. Remove. Chop onion and fry it in bacon grease until golden brown. Add peas or beans and bring to a boil. Home-canned vegetables should be boiled 20 minutes before tasting. Season to taste.

Part 8b of Supplement - Page 21 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Creamed Tuna Fish

1 can flaked tuna fish

 $\frac{1}{2}$ cup medium white sauce

Heat fish in sauce, and add seasoning. Serve on cooked rice, toast, crisp crackers, or mashed potato.

Welsh Rarebit (Cheese)

 $\frac{1}{2}$ cup thin white sauce 1 cup ($\frac{1}{2}$ 1b.) grated cheese (or cheese cut in small pieces) 1/8 teaspoon mustard 2 slices buttered hot toast

Make white sauce. Add mustard and cheese. Cook over boiling water until cheese is melted and mixture is smooth, stirring constantly. Serve at once on toast.

Gravies and Sauces

Brown Gravy

1 tablespoon butter or fat in which meat was cooked

l tablespoon flour

salt

l cup beef broth or boiling water

pepper

Brown fat in pan, add flour and brown well while constantly stirring. Add liquid and stir until smooth and thick, season to taste and simmer for 5 minutes.

Milk Gravy

To grease left after frying bacon or ham, add canned milk to make desired amount of gravy. Season with salt and pepper and cook, stirring until the mixture thickens.

White Sauce

1 tablespoon flour 1 cup milk (if canned, $\frac{1}{4}$ teaspoon pepper 1 teaspoon to 1 tablespoon fat dilute $\frac{1}{2}$ with water) $\frac{1}{4}$ teaspoon salt

Mix ingredients as given. More or less flour may be used to make sauce the desired thickness.

Part 8b of Supplement - Page 22 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Pie Crust

2 cups flour

1 teaspoon salt

l cup Lard

Enough water to mix dough so that it sticks together

Combine in order given until mixture just sticks together, then roll out but do not mix or knead. Just put it together enough so that it can be put in the pan.

Apple Pie

2 or 3 cups of canned apples, sliced (depending on size of pie pan) cinnamon small piece of butter l cup sugar teaspoon vanilla nutmeg approximately 1 tablespoon flour l recipe for pie crust

Line a pie pan with pie crust. Put a little flour (approximately 1 tablespoon) in the bottom of the crust. Mix apples, seasonings and sugar together and fill the pie crust. Dot with pieces of butter and sprinkle with a little more cinnamon. Cover with another crust in which 2 or 3 slits have been made. Bottom crust should be dampened around edge of pan with water to make top crust stick to it. Seal two crusts together by pressing with the prongs of a fork and cut away surplus crust. Dampen top crust with a little milk or beaten egg yolk to make it richer and brown. Bake in a moderate oven approximately one hour.

Custard Pie

3 tablespoons sugar 1/8 teaspoon salt

2 eggs $1\frac{1}{2}$ cups milk (if canned, dilute \frac{1}{2} with water)

1 teaspoon nutmeg ½ recipe for pie crust

Beat eggs slightly; add sugar, salt and milk. Line pie tin with pie crust. Strain in mixture, and sprinkle with few gratings of nutmeg. Bake in quick oven at first to set rim. Decrease the heat, as egg and milk in combination need to be cooked at a lower temperature. When pie is done, a silver knife when inserted will be clean when it is taken out.

Huckleberry Pie

1 tablespoon flour Huckleberries 3/4 cup sugar

Butter

l recipe for pie crust

Line pie pan with crust, sprinkle bottom with flour, then put half of sugar in bottom. Put in berries (filling to top). Put in rest of sugar and sprinkle with dots of butter. Then put on top crust and bake.

Part 8b of Supplement - Page 23 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Raisin Pie

 $\frac{1}{2}$ package raisins 1 cup sugar 1 teaspoon butter 1 teaspoon lemon extract $\frac{1}{2}$ recipe for pie crust 2 tablespoons cornstarch

Combine raisins and water and let boil until raisins are real soft. Mix together cornstarch and sugar, adding a little water to make a paste, then add to first mixture and cook until clear. Take off stove and add 1 teaspoon lemon extract and butter. Pour mixture into a baked pie crust.

Puddings

Apple Brown Betty

l cup soaked dried apples (or dried applesauce) $\frac{1}{2}$ cup soft bread crumbs or 1/3 cup stale bread crumbled up $\frac{1}{4}$ cup sugar teaspoon cinnamon and 1/8 teaspoon nutmeg $\frac{1}{2}$ tablespoon butter or margarine

Put one-half the apples in baking dish. Sprinkle half the sugar, crumbs, and spices over the apples. Dot with half the butter. Add remainder of apples and cover with remainder of sugar, bread crumbs, seasoning, and butter. Bake in moderate oven $\frac{1}{2}$ hour or until apples are cooked (if soaked raw apples are used) and the top is browned. Serve with hard sauce, which is made by creaming butter and powdered sugar together.

Chocolate Bread Pudding

1 cup old bread 1 egg 1/8 teaspoon salt 2 cups milk (if canned, 2 teaspoons vanilla 1 square unsweetened chocodilute ½ with water) 1/3 cup sugar late or 2 tablespoons cocoa

Heat milk in small baking pan. Remove from stove. Break bread into $\frac{1}{2}$ -inch pieces and soak in milk about $\frac{1}{2}$ hour. Melt chocolate in small pan over hot water and slowly stir in enough of the milk to make it of a consistency to pour. Beat egg. Stir in sugar, chocolate mixture, salt and vanilla. Pour over bread mixture and mix thoroughly. Bake in a slow oven about 1 hour or until knife inserted in center shows no milky liquid. Serve hot or cold.

Cocoa Pudding

Place milk in double boiler to heat. Mix dry ingredients and moisten with a small amount of milk. Add to hot milk and stir until mixture thickens. Cover and cook about 15 minutes longer.

Part 8b of Supplement - Page 24 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Cornstarch Pudding

Mix 1 tablespoon cornstarch with a little milk. Add flavoring desired and pinch salt, tablespoon butter. Bring 1 pt. milk (if canned, dilute $\frac{1}{2}$ with water) barely to boiling point (part has been mixed with cornstarch), add the cornstarch, 1 well-beaten egg, 2 tablespoons sugar, boil two or three minutes, stirring briskly.

Variations of Cornstarch Pudding:

Chocolate Pudding

Mix I tablespoon cocoa with a little of the milk and add to above recipe.

Maple Pudding

Add $\frac{1}{4}$ cup maple syrup instead of part of sugar called for in above recipe.

Cooked Dried Fruit Pudding or Canned Fruit Pudding

Add either cooked dried fruit or canned fruit, as desired, to above recipe after pudding has been removed from heat and has been allowed to cool till mixture is lukewarm.

Rice Pudding

cup rice | 1 cup milk | 2 tablespoons dry eggs (or 2 eggs) | 2 teaspoon salt | 1 cup water | 1 teaspoon manifela.

Cover rice well with water, add salt, set on back of stove and cook slowly until done. Add milk, water, eggs, vanilla and mix all together. Bake until firm when pan is shaken. Raisins may be added to improve the flavor.

Tapioca Pudding

Cook being tapioca and $\frac{1}{2}$ teaspoon salt 15 minutes in a pint of boiling water, stirring constantly; then add $\frac{1}{2}$ cup sugar and 1 beaten egg and cook until it thickens like custard, stirring steadily.

Variations of Tapioca Pudding:

Cooked dried fruit or canned fruit or jam may be added.

Sauces

Applesauce

3 medium apples $\frac{1}{4}$ cup water $\frac{1}{4}$ cup sugar Few grains salt

Wash apples, peel, cut into quarters and remove core. Skin may be retained if desired. Place in small saucepan. Add water and salt and cook until soft. Add sugar when nearly done. Stir to prevent sticking to saucepan.

Part 8b of Supplement - Page 25 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Dried Fruit Sauce

1 cup dried fruit
3 cups boiling water

1/8 teaspoon salt 2 tablespoons sugar

Wash fruit thoroughly, pour on boiling water, cover tightly and soak for 1 hour or more. Add salt and simmer for about 30 minutes. Add sugar at end.

Raisin and Rice Sauce

 $\frac{1}{2}$ cup rice 2 cups water $\frac{1}{2}$ teaspoon salt 1/3 cup raisins

Bring water to boiling point and add salt. Wash rice several times in cold water. Stir rice into boiling water and cook in double boiler until a kernel pressed between the fingers leaves no hard center, about 40 minutes. Add raisins after cooking 20 minutes.

Salads

Cabbage Cole Slaw (1 serving)

l cup shredded cabbage l tablespoon sugar 1 teaspoon salt
1/16 teaspoon pepper

- 1 tablespoon vinegar or lemon juice
- 2 teaspoons cold water or milk

Combine all ingredients except cabbage and mix well. A few minutes before serving, pour over cabbage. Add seasoning.

Carrot Salad (1 serving)

3/4 cup shredded raw carrots $\frac{1}{4}$ cup raisins

Crisp greens, if desired French dressing

Combine carrots and raisins. Mix with salad dressing. Serve on crisp greens if desired.

Lettuce Salad (1 serving)

Keep lettuce wrapped in a clean damp cloth in a closed jar or other contained in as cool a place as possible. Slice the lettuce; add salt or any salad dressing desired.

Potato Salad - Cold

Slice or dice cold, cooked potatoes. Season with salt, chopped-up onion, and salad dressing. Sliced, hard-cooked eggs are also good with potatoes in salad.

Part 8b of Supplement - Page 26 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Dressings

French Dressing

1 teaspoon salt 1/16 teaspoon pepper 1 cup salad oil 2 teaspoons sugar 2 buds garlic split twice or 1 teaspoon grated onion $\frac{1}{2}$ cup vinegar (may omit)

Place ingredients in jar and shake vigorously. Shake each time just before serving. Keep covered in a cool place. Remove garlic when well seasoned. Use on lettuce, cabbage, tomatoes, cucumbers, raw carrots, various vegetable combinations.

Soups and Chowders

Corn Chowder

l small slice salt pork, diced

2 tablespoons chopped onions

1/2 cup canned corn or 1/2 cup soaked dried corn

1/4 cup mashed potatoes or diced cooked potatoes

2/3 cup boiling water
1-1/3 cups milk
2 crackers
pinch of salt & pepper

Fry salt pork. Remove pieces from fat. Brown onions in fat drippings. Add corn and water and cook 10 minutes. Add milk, potatoes, pork pieces, and onions. Heat. Season to taste. Pour over crisp crackers just before serving.

Dried Bean or Pea Soup

Wash I cup of dried beans or dried peas, and soak over night in I quart of water. In the morning, add a quart of water, $\frac{1}{4}$ pound of salt pork, an onion, and a few stalks of celery, if desired. Simmer until the beans or peas are tender. Remove the salt pork and put the rest through a strainer if a smooth soup is wanted. Cut the salt pork into tiny pieces. Add a tablespoon of flour mixed well with a little water to keep the bean pulp from settling to the bottom. Stir, reheat, and season with salt and a dash of pepper.

Variations of Dried Bean or Pea Soup:

With Ham

In place of the salt pork in the recipe above, cook the beans with a ham bone, or add some chopped left-over ham to the soup a little while before serving.

Crisp Bits of Bacon - Chipped Beef - Cooked Sausage

All these do something to the flavor of bean soup, too. Add any one of them toward the end of the cooking when the beans are almost done.

Part 8b of Supplement - Page 27 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Roasted Peanuts

Finely chopped or ground peanuts are good in bean soup, also, for their taste and for their food value.

Tomatoes or Carrots

These give color and add flavor to bean or pea soup.

Lima Bean Chowder (4 servings)

1 teaspoon salt
1 strip bacon or salt pork
1 tablespoon minced onion
2 cup diced carrots
3/4 cup milk
1 tablespoon flour
1 cup canned tomatoes
1 teaspoon pepper
1 cup canned tomatoes
1/8 teaspoon pepper
1 tablespoon chopped green pepper (may omit)

Clean beans and soak over night in water. Cook in same water with $\frac{1}{2}$ teaspoon salt. Add water as needed. Dice bacon and cook until browned. Add to beans. Cook until tender. Add bacon and milk and thicken with paste made from the flour and I tablespoon of cold water. Stir until thickened. Strain tomatoes and heat them. Add tomatoes to the chowder just before serving. Combine below the boiling point. Taste and add seasoning if needed.

Potato Soup

Two large potatoes sliced in small pieces and boiled in enough water to cover, season with salt, and pepper, a little butter, sliced onion, and $\frac{1}{4}$ cup of sweet milk.

Tomato Soup

l can tomatoes $\frac{1}{2}$ cup canned milk salt, pepper to taste $\frac{1}{2}$ teaspoon soda $\frac{1}{2}$ cup water lump of butter

Heat tomatoes. Add soda and stir. Add milk, water and seasoning, and heat. Add butter. Chopped onions or bacon fried in hot fat may be added if desired.

Vegetable Chowder

2 strips bacon
3/4 cup cooked brown rice or cubed potatoes
1/3 medium size carrot, diced
3/4 cup cut cabbage
3/4 teaspoon salt
pepper

Fry bacon, add onion and carrot, and cook slowly until they begin to brown. Add tomatoes, water, rice, and seasonings. Boil slowly 20 minutes. Add cabbage and cook 10 minutes longer.

Part 8b of Supplement - Page 28 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Vegetables

Baked Beans with Pork (3 to 4 servings)

l pt. navy beans l teaspoon salt 2 tablespoons dark molasses $\frac{1}{4}$ lb. fat salt pork $\frac{1}{2}$ tablespoon brown sugar $\frac{1}{4}$ teaspoon dry mustard (may omit)

Stir brown sugar, molasses and mustard into boiled beans and pour into baking dish. Wash salt pork and scrape rind. Gash rind every inch. Press pork into top of beans, leaving only rind exposed. Add additional water to cover beans if necessary. Cover and bake in slow oven 6 to 8 hours, adding additional water when necessary to keep beans covered. Uncover during last bour to brown.

Boiled Beans (3 to 4 servings)

1 pt. navy beans 2 teaspoons salt water to cover

Look over beans and discard bad ones. Wash. Cover with fresh water and soak over night. Next day, add salt and cook in same water until tender. Add water to cover when necessary. Navy beans require 2 to 3 hours of boiling at sea level and more at higher elevations. (Pieces of salt pork, bacon rind, bacon or ham bone may be cooked with beans and an onion may be added while cooking for flavoring if beans are to be eaten boiled.)

Creamed Lima Beans

1 cup dried beans salt and pepper 3/4 cup milk

Soak dried beans over night in cold water to cover. Drain and cook in boiling salted water until soft. Drain, add cream, add a little butter and season well. (Undiluted canned milk may be substituted for cream.

Navy Bean Patties (3 to 4 servings)

2 cups boiled beans 1 tablespoon chopped parsley (may omit) 1 tablespoon diced onion Salt or pepper to taste Fat for frying

| cup bread crumbs
| tablespoon lemon juice or
| vinegar
| cup or less melted butter or
| bacon drippings

Mix thoroughly. Taste and add seasonings if necessary. Make into patties $\frac{1}{2}$ " thick. Fry until brown on both sides. Serve hot with Stewed Tomatoes.

Part 8b of Supplement - Page 29 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Beets - Boiled and Vinegared

Combine $\frac{1}{4}$ cup water and $\frac{1}{4}$ cup of vinegar, $\frac{1}{4}$ teaspoon salt, a dash of pepper and $\frac{1}{2}$ tablespoon sugar. Pour this over 1 cup of sliced hot boiled beets. Serve hot or cold.

Five-Minute Cabbage

2 cups sliced cabbage 1 pt. boiling water 1 teaspoon salt $\frac{1}{2}$ cup milk

Place cabbage in boiling salted water. Boil rapidly, uncovered. Young cabbage requires about 3 minutes boiling; old cabbage about 12. Drain. Add milk. Butter, or vinegar, sugar and fat, may be substituted for milk.

Buttered Carrots

2 carrots ½ teaspoon salt boiling water 1 tablespoon butter

Slice carrots. Add salt and boil in about $\frac{1}{2}$ cup water. Boil rapidly, covered, in as small an amount of water possible to prevent burning. Cook 8 minutes or until tender. Add butter.

Carrots and Peas

l cup carrots 3 tablespoons butter $\frac{1}{2}$ teaspoon salt 1 teaspoon sugar 2 cup peas 3 tablespoons flour 1/8 teaspoon 1 cup milk pepper

Boil carrots until tender. Combine with cooked peas, reheat and serve with melted butter or savory fat or make a sauce of the flour, fat, milk, and seasonings; add cooked carrots and peas, reheat and serve hot. If carrots are in cans, it is not necessary to cook them first; just mix them with the peas and then fix accordingly.

Corn Fritters

1 cup flour
1 small can corn
1 cup milk
1 teaspoon melted butter
2 teaspoon salt
2 eggs, beaten

Chop corn very fine and add salt, pepper, well-beaten eggs, butter, milk, flour and baking powder. Fry in deep fat.

Scalloped Corn

1 small can corn salt, pepper bread crumbs or crackers (mashed up real fine) milk

Combine corn, bread crumbs or crackers, salt, pepper, and enough milk to cover and bake in oven until it gets firm or sets.

Part 8b of Supplement - Page 30 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Wilted Wild or Tame Greens

- 2 slices bacon or 2 tablespoons meat drippings, ham fat, butter, or other fat
- 2 tablespoons vinegar
- 2 tablespoons sweet or sour cream (may omit)
- l quart washed, young dandelions, turnip tops, mustard tops, spinach, leaf lettuce or other greens

Pinch of salt

Wash and sort greens. Wash by lifting greens from pan of water, instead of pouring water off from greens. Wash several times until grit disappears. Dice bacon and fry in a heavy flat pan until golden brown. Remove to hot serving dish. Cut up any large leaves of greens. Add greens to hot fat and cook at moderate heat, turning frequently. Pour vinegar and cream over greens and sprinkle with salt. Cover and cook until wilted and tender, 5 to 10 minutes. Stir bacon into greens. Season to taste. Serve very hot with their own juices in covered dish.

Variations of Wilted Wild or Tame Greens:

Very tender green beans may be sliced thin lengthwise and cooked this way.

After frying smoked ham or other fat meat, take up meat on hot platter and wilt greens in same frying pan in grease that came from meat.

A tablespoon of grated onion may be added to greens; or diced onion may be cooked first in the fat until yellow.

Bits of any left-over meat may be browned in the fat first instead of bacon.

A little flour may be sifted over greens when nearly done and stirred in to thicken the juices.

Fried Parsnips

Boil parsnips whole, split lengthwise, and strip out the tough center. Dip the halves in flour and fry in fat until they are golden brown. Or, mash and season the parsnips to make little cakes, and fry them.

Baked Potatoes

Wash and dry potatoes of as nearly same size as possible. Put into a medium-hot oven and bake until tender from 40 to 60 minutes. If you want the skin to be soft, rub a little fat on potato before putting in oven. When baked, cut criss-cross gashes in skin of potato on one side. Then pinch potato so that some of the soft inside part pops up through the broken skin and drop in meat drippings, bits of crisp fried salt pork, butter, or other table fat.

Part 8b of Supplement - Page 31 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Boiled Potatoes

Scrub medium-sized potatoes. Drop them into a kettle of salted, boiling water - enough to cover the potatoes. Cook until tender. Drain at once so they won't get waterlogged. Serve in jackets or peel and season with salt and fat.

Fried Potatoes and Onions

Peel and slice thinly two or three raw potatoes. Drain well. Peel and slice one onion very fine and mix with potatoes. Place about 3 tablespoons of fat (bacon grease or drippings preferable) in frying pan and allow to heat but not to burn. Pour potatoes and onions in fat and cover with lid. Turn often to prevent sticking and to allow to soften and brown evenly. Season with salt and pepper to taste.

Potato Hash

Melt 3 tablespoons of fat in a frying pan. Put in 2 cups chopped, cooked potatoes, 2 cups chopped, cold meat, salt, and pepper. Moisten the mixture with $\frac{1}{2}$ cup hot water or gravy. Cover pan. Cook slowly until the underside is rich brown.

Mashed Potatoes

Boil potatoes well-done. If they have been boiled in their jackets, strip those off. Then mash the potatoes thoroughly and quickly. Beat in hot milk a little at a time, until potatoes are fluffy and smooth. Season, and add butter or fat if you like.

Potato Patties

Pat left-over mashed potatoes into little flat cakes of size desired. Then fry them in either bacon grease or butter until the outside of the patties are brown.

Variations of Potato Patties:

Mix in with the mashed potatoes chopped, cooked meat, fish or grated cheese.

Mix in with the mashed potatoes an egg and fry. Salt and pepper to taste.

Scalloped Potatoes

Make a white sauce of the fat, flour, milk, and salt. Arrange alternate layers of raw potato and sauce in greased casserole. Cover with crumbs and bake uncovered in moderate oven about 1 hour.

Part 8b of Supplement - Page 32 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

Variations of Scalloped Potatoes:

Substitute grated cheese for the buttered bread or cracker crumbs.

Mix in with the potatoes, cubed ham or spam or left-over meat.

Rice Creole

3/4 cup rice (boil until tender) l tablespoon catsup cup of beef stewed de can tomatoes

l small onion salt, pepper

Boil tomatoes and combine with chopped stewed beef; mix in onion sliced. Add catsup, salt and pepper and let simmer. When rice is tender, drain and add meat mixture and set on back of stove to keep warm until ready to serve.

Spinach

2 slices bacon 8-oz. can spinach \frac{1}{2} teaspoon salt 1 tablespoon butter

Dice bacon and fry until lightly browned. Add spinach, which has been drained, together with butter and salt, and cook for a short time or until well heated.

Stewed Tomatoes

l cup tomatoes dash pepper $\frac{1}{2}$ tablespoon flour teaspoon minced onion $\frac{1}{2}$ tablespoon sugar $\frac{1}{2}$ tablespoon butter teaspoon salt

Combine all ingredients, first mixing flour and sugar. Simmer 10 minutes.

Variations of Stewed Tomatoes:

Substitute for flour, fine bread crumbs or rolled cracker crumbs.

Tomatoes with Macaroni

1/3 package macaroni l teaspoon salt bonion (cut fine)

1 can tomatoes

little pepper

1 tablespoon butter or bacon grease

1 teaspoon sugar

Cover macaroni and salt with water and cook until macaroni is done. Drain water off if any. Add rest of mixture and let cook 15 minutes. If a little bacon is cut fine and fried with onion and added, flavor greatly improved.

Part 8b of Supplement - Page 33 R-6 F. C. Handbook Part II - Chapter 9 Added 6-1-43 No. 14

FIRE CONTROL HANDBOOK

REGION 6



Part III
SUPPRESSION

Chapter 1
FIRE FIGHTING

PART III—SUPPRESSION—CHAPTER 1 FIRE FIGHTING

TABLE OF CONTENTS

	Page No.
INTRODUCTION	III-1-1
FIGHTING SMALL FIRES	III-1-1
WHAT MAKES A FIRE BURN	III-1-1
FACTORS WHICH INFLUENCE THE SPREAD OF FIRE	III-1-1
Fuels	III-1-2
Weather	III-1-2
Topography	III-1-2
HOW TO PUT OUT SMALL FIRES	III-1-2
In Litter and Duff	III-1-3
In a Log.	III-1-4
In a Snag	III-1-5
In a Stump	III-1-6
In Grass	III-1-6
In Ferns or Weeds	III-1-6
In a Mixture of Fuels	III-1-6
GOOD PRACTICES IN FIGHTING ALL SMALL FIRES	III-1-7
MOPPING UP	III-1-7
SAFE PRACTICES	III-1-8
REPORT ON FIRES PUT OUT	III-1-8
FIGHTING MEDIUM AND LARGE-SIZE FIRES	III-1-8
FIRE BEHAVIOR	III-1-8
Fuels	III-1-8
Fire Weather Factors and Effects	III-1-9
Topography	III-1-11
Fire Habits	III-1-13
FUEL-TYPE MAPS	III-1-13
Rate of Spread	:III-1-13
Resistance to Control	III-1-14

TABLE OF CONTENTS—(Continued)

	Page No.
FIRE FIGHTING ORGANIZATION AND RESPONSIBILITIES	III-1-14
Medium-Size Organizations	III-1-14
Large-Size Organizations	III-1-14
Functional Control Line Organization	III-1-18
FIRE STRATEGY AND MANAGEMENT	III-1-21
Planning Fire Suppression Needs	III-1-21
Travel to Fire	III-1-22
Sizing Up Fire	III-1-23
Plan of Action.	III-1-23
FIRE FIGHTING METHODS AND TECHNIQUES	III-1-23
Direct Method	III-1-24
Parallel Method	III-1-24
Indirect Method	III-1-27
Snagfalling	III-1-31
Use of Water	III-1-32
Reburns	III-1-35
Морир	III-1-35
Safety	III-1-37

INTRODUCTION

Fire suppression, as used herein, deals with the knowledge and skill required to most efficiently put out a fire. The need for developing knowledge and skill in putting out fires continues great, as indicated from the record of fire occurrence. These records show that during a fire season 2000 fires on the National Forests of Oregon and Washington can be expected, that 95 percent of these fires will be put out while small and that 5 percent may reach medium size or larger before they are extinguished. The knowledge and skill required in extinguishing small fires differ in many respects from that required to efficiently put out large fires. Therefore, they will be treated separately in the text that follows:

FIGHTING SMALL FIRES

The job of suppressing a small fire may be assigned to one smokechaser, or to a small crew of from 2 to 10 men. Whether a smokechaser or firegoer is dispatched to a fire alone or is placed in charge of a small crew, the objective to "Get the Fire While It's Small" remains the same. There is a greater probability of accomplishing this more easily and safely if the smokechaser thoroughly understands and applies his knowledge to three main things:

- 1. Conditions necessary for a fire to burn.
- 2. Factors which influence the spread of fire.
- 3. Best method of suppressing the fire—singlehanded or by directing the efforts of a small crew.

The more important facts regarding each of the foregoing and their practical application to fire fighting are explained in the following sections:

WHAT MAKES A FIRE BURN

A fire burns when the following elements or conditions are present:

- 1. There must be something to burn—fuels such as wood, bark, pitch, ferns, moss, grass, or other burnable material.
- 2. The fuels must be exposed to the air. A fire needs oxygen to burn.
- 3. The temperature of the fuel must be raised to the kindling point. This varies from 600 to 800° Fahrenheit.

That there must be something to burn is obvious. The important thing to remember is that removing the unburned fuel from the edges of a surface fire is one way of stopping its spread. Just how and when this is done is described later.

That fuel must be exposed to the oxygen in the air in order to burn can be observed by opening and closing the drafts on a stove. When they are open, more oxygen reaches the fuel and the fire burns hard—if the drafts could be closed airtight, the fire would go out. The rate

of burning is controlled by the amount of air entering the stove. Fanning a camp fire with a hat supplies more oxygen and causes it to burn more briskly. To a major degree, small forest fires can be slowed down by reducing the supply of oxygen. This is accomplished by smothering fire with clean dirt and in other ways later described.

In order to burn, fuels must be raised to the kindling temperature and that temperature must be maintained. In starting a camp fire, the flame of a match will raise the temperature of dry shavings or fine twigs to the ignition point almost instantly. The flame from the shavings in turn provides enough heat to ignite the heavier fuels. Larger chunks on a camp fire burn more readily if they are in a compact pile. In this way the heat is saved to ignite additional fuel-instead of being lost to the large space surrounding the fire. If the chunks are separated, the camp fire does not burn as well and will usually go out. Study of conditions that cause a camp fire to burn readily or to smolder will reveal many useful facts which apply to controlling a forest fire. For example, when a log burning on the under side is rolled out of its hot bed of coals and the hot side is turned up, the fire will slow down and in many cases smolder or go out because ignition temperature cannot be maintained.

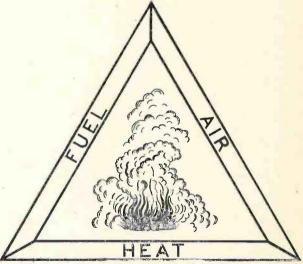


Fig. 1—Elements required for fire.

The three sides of the triangle are represented by fuel, air (oxygen), and heat. Remove any one of the sides and the fire will go out.

FACTORS WHICH INFLUENCE THE SPREAD OF FIRE

The things which cause a fire to burn and spread in any type of country (timbered, brush, burned-over areas, grasslands) are: (1) fuels, (2) weather, and (3) topography.

Fuels

May be divided into two main classes:

- 1. Flash fuels, such as dry cheatgrass, tree moss, dead ferns, dead needles, twigs, and branches, and green or live fuels, such as needles, ceanothus, greasewood, bitterbrush, fern, and sagebrush, which become dry and flashy when subjected to intense heat.
- 2. Slow-burning fuels, such as logs, stumps, and deep duff. (Duff is the compact layer of decomposed leaves, needles, and other small material between the mineral earth and new forest litter)

Dry flash fuels are easily ignited and spread rapidly on slopes or when fanned by wind. The heat given off by dry dead flash fuels dries out live fuels which contain oil and resins. When once ignited, they burn rapidly and extremely hot. Flash fuels serve as kindling for slow-burning fuels which burn readily when dry and throw off large volumes of heat.

Weather

A firefighter is chiefly concerned with three weather factors: wind, moisture, and temperature.

- 1. Wind causes fire to spread for three reasons:
- a. It provides a fresh supply of oxygen to the fire, which keeps it burning and makes it burn hotter.
- b. It pushes the fire along by flattening out the hot air and flames over the unburned fuel. This brings the nearby fuels up to the kindling point faster than in still air.
- c. Wind carries sparks and embers ahead of the main fire to set new "spot fires."

The stronger the wind, the faster the fire spreads. Thus, a 10-mile wind on level ground or moderate slopes will increase the size of a fire at least 10 times as fast as a 1-mile wind. On steep slopes the rate of spread will be faster.

During the months of July, August and September, general prevailing winds from the southwest are likely to produce damp cloudy weather and may result in rain. Northwest winds usually are an indication of fair weather. Winds from the northeast and east are hot and dry. They absorb moisture from flash fuels very rapidly and also dry out heavier fuels. Winds from the east are a sure sign of bad fire weather, particularly in and west of the Cascade Mountains.

In mountainous country, local winds have a tendency to blow up the valley during the day and down at night.

General prevailing winds may blow at a fairly uniform velocity from one to several days. Local winds have a tendency to increase in velocity from about 10 a.m. until 4 p.m. and to decrease toward evening.

2. Moisture conditions are extremely important to the

firefighter, because dry fuels ignite and burn more readily than wet fuels. Dry air tends to draw moisture out of fuels. Light fuels, such as dead grass, ferns, moss, and weeds, dry out much more rapidly than heavy fuels, such as poles, logs, and snags. Light fuels dry out during the day when the air is dry and absorb moisture at night when the air is damp.

Therefore, a fire usually burns more rapidly in the daytime than at night. Firefighters make use of this factor by doing all work possible on a fire during the night and early morning when the fuels are the dampest. During prolonged drouths the heavy fuels become progressively drier, and fires are especially difficult to control, because then both the heavy fuels and the light fuels burn rapidly.

3. Temperature has little direct effect on the spread of a fire. If the fuel is equally dry, a fire will burn about as well at 30° F. as it will at 90°. The difference of 60 degrees has little effect when the fuel must be raised to a temperature of at least 600° before it will burn. A rise in temperature has a drying effect on the fuels unless the moisture content of the air increases due to other conditions.

Topography (the shape of the country—as level, rolling or steep)

Affects the spread of fire. A fire spreads uphill faster than in other directions. The steeper the slope, the faster the fire will travel. Heads of canyons and the low point or saddle between ridges cause drafts which have the same effect on a fire as wind. Slope will also cause burning material to roll and may scatter fire to the bottom of the hill. On very steep slopes even large burning logs will roll. Generally, fire will spread faster on the drier south and southwest slopes than on north and northeast slopes.

HOW TO PUT OUT SMALL FIRES

A small fire is one that can be put out by one to ten men. The first job in putting out a small fire is to stop spread; the next thing to do is to put it dead out.

If the fire is spreading on the ground, it must be stopped on the ground. If it is spreading above ground on account of heat or flying sparks and embers, these sources of spread must be reduced or eliminated.

A fire is put out by doing one or a combination of three things: (1) remove or cut off fuel supply, (2) lower the temperature, and (3) reduce the supply of air (oxygen).

When the smokechaser arrives at the fire, whether he is alone or in charge of a small crew, he does the following things in the order named:

1. Places fire equipment pack in a safe place (where it is not likely to be burned up).

- 2. Checks time of arrival, and records in notebook.
- 3. Quickly sizes up the fire to determine cause, approximate area, type of fuel in and near the fire, slope and wind. This may be done from one vantage point on some fires; on others, due to type of cover and topography, it may be necessary to walk around the fire.

The purpose of sizing up the fire is to obtain a fairly accurate idea of its size, rate and direction of spread, and danger points, which if not given prompt attention may result in a large fire. All of these things are mentally listed and weighed one against the other to the end of deciding on where and how to first attack the fire.

If the fire appears to be "man caused," the smokechaser should look for tracks, camp fire or lunch remains, scraps of paper, tire marks, cigarette or cigar butts, or anything else which will aid in determining how it was started, provided this can be done without interfering with your work of stopping the spread of the fire. This information and all material found should be preserved and given to the district ranger. Tracks should be preserved on the ground by covering or marking them so they will not be rubbed out by action of the firefighters.

Danger points for different types of fires are discussed below, but in general they include conditions, such as:

- 1. Fingers of fire running up slopes.
- 2. Surface fire approaching the base of snags, mossy trees, green trees with low hanging branches, clumps of dense reproduction, dry down logs, or stumps.
- 3. Spot of fire in snag which can be reached with dirt or water.
- 4. Sparks being thrown by snags, stumps and burning logs near fire edge.
- 5. Spot fires which may be potentially more dangerous than the main fire.

If the smokechaser is alone on the fire, it is especially important to keep cool, plan his attack in a way to make every lick count, hitting the danger points first. Planned, hard work during the first hour or two will effectively control most small fires. This does not mean madly rushing from one spot to another. Such practice not only exhausts energy but may result in a bad accident. Accidents are usually caused by failure to size up and think before acting, inattention to the job at hand, and taking unnecessary chances. An accident may result in the smokechaser becoming injured and losing his fire.

When two experienced smokechasers are sent to a fire, they usually size it up together and agree what each is to do. The leader of a small crew of firefighters will find it best to have his men take their fire tools out of the packs, and perhaps take a short rest if they have had a hard hike, while he sizes up the fire. Next he instructs each man what tools will be needed and assigns each to a specific job. Job assignments should be based on previous experience and aptitude. If questioning or observation indicates inability to do a job, take a minute and demonstrate how. Be sure the men know the hazards around a fire, and follow safe working practices. If a man can't or won't work safely on one job, give him another less hazardous job. It may take the whole crew to pack out an injured man.

After the men are lined out and working on initial attack, the job of the leader is to keep alert for hazards, plan ahead on what needs to be done next and what to do to quickly control the fire. He watches for danger points and pitches in and helps out for a few minutes here and there, as necessary.

To summarize, the crew leader is responsible for planning the attack, instructing and directing the work of the crew, being constantly on the alert for their safety, helping out on the danger points, all to the end of controlling and mopping up the fire in the shortest time possible. The following paragraphs explain the general procedure for putting out a fire in the more common types of fuels:

How to Put Out Small Fires in Litter and Duff

Forest litter, such as small branches, dead limbs, leaves and needles, becomes highly inflammable in dry weather, and a fire may spread rapidly in this surface material, especially if it is on a slope or the wind is blowing. After the surface material has been consumed, fire will continue to smolder in the duff underneath, which may vary in depth from two or three inches to a foot or more, and in roots and rotten wood. All such fire must be found and put out, because smoldering fuels will burst into flame after they have been dried by the heat and exposed to the air.

On arrival at a fire in litter and duff, look it over and decide what to do to prevent further spread. If there are places where it is burning briskly, cool them off by throwing clean dirt (soil free from litter, rotten wood and humus) on them with a shovel, using a sweeping motion. If the fire is spreading in surface litter, scrape it away from the flames until the spread is stopped and the fire is confined to the duff. Then with a digging tool or shovel, dig or scrape a fire line to clean dirt, keeping as close to the fire edge as possible.



Fig. 2-Fire line.

Throw all unburned material away from fire and burning material into the fire. The fire area should be examined for places where it may be burning in roots, rotten wood or deep duff. These places should be dug out and the roots chopped off.

If water is readily available, it should be sprayed or poured on the burning places until they are out. After some water has been used, the burning material should be stirred to allow the water to saturate it. When the fire is apparently out, it should be checked over very carefully with the hands to be sure that every piece of material is cold. Get the last spark.

If water is not available, coals and smoldering materials should be mixed with damp dirt and worked over and over until out. All burned materials and ashes should be tested with the bare hands to make certain they are extinguished.

If the fire is on a steep slope and it is spreading up the hill, ordinarily a fire line should first be quickly dug or scraped around the head of the fire to prevent further spread. The line on the upper side may need to be fairly wide to prevent the tongues of flame from crossing it. If there is danger that cones or other burning material will roll downhill from the fire, a trench shaped like a plowed furrow and built up on the lower side to catch and hold burning material should be dug around the lower edge of the fire.



Fig. 3—Fire line dug to catch rolling material.

It is particularly difficult to find the last spark in a duff fire. The alert firefighter will study the surface of the fire area for several minutes at a time from many different positions on the fire edge.

How to Put Out Small Fires in a Log

If a fire is burning in a log, first cool off the places where it is hottest. This should be done with damp dirt, thrown with a shovel. A fire line should be dug around the burning portion to prevent spread of fire on the ground. The line should be located a sufficient distance from the log to provide a safe working area.

If the fire is on a steep slope, the fire line on the lower side should be trenched like a plowed furrow to catch any rolling embers and burning chunks. If possible, the log should be turned so that it will lie up and downhill to prevent it from rolling and scattering fire.



Fig. 4—Log turned to lie up and down slope.

If the log cannot be turned, it should be securely blocked with rocks or rolled into a prepared trench.

After the fire has been cooled down, chop or saw off the part of the log that is not on fire. Then roll the portions apart. Fire should be scraped or chopped from the burning section and, if log is rotten, it should be split open if possible so the fire will be exposed. Care must be exercised when chopping fire out of a log so as not to scatter burning chips outside of fire area. If water is available, it should be sprayed on the burning coals or parts with backpack pump can or poured on with a pail or hat. If water is not available, all burning portions should be rubbed well with clean dirt. Scrape out the mixture and scatter it over cleared bare ground.

If there are several burning chunks or pieces, it is usually necessary to clear all debris and duff from a nearby area. The area of clean dirt will look like a small garden patch and will be used as a "boneyard."



Fig. 5-Boneyard.

Then rub each burning piece in the clean dirt until it can be handled and rubbed with the hands. Lay the pieces in the "boneyard" so they do not touch each other. The burned pieces are "bones"—the bones are parallel to each other. If the fire has burned into the ground, it should all be dug out and mixed with water or damp dirt until it is out. All the burned area and portions of the log should be examined carefully by looking for smoke and feeling with the hands to make certain that every spark of the fire is out before it is left. Check twice to be sure.

How to Put Out Small Fires in a Snag

Snags are dead trees in various stages of decay that are still standing. When one is afire, it becomes a dangerous fire spreader. Sparks from a snag may carry fire for long distances. If a ground fire is burning around the snag, it will be necessary to first decide whether the spread of the

ground fire should be stopped or the snag felled. That which is causing the fastest spread should usually be worked on first.

The burning snag should be felled within the area already on fire. If this cannot be done, it may be best to prepare a safe place in which to fall it by first clearing away brush, trash, and other material. The deciding factor will be whether spot fires, starting from the standing snag while its bed is being prepared, are more dangerous than the ground fire which may result if the snag is felled without clearing a place in which to fall it.

A third man should be used in the falling crew if available to watch for falling limbs, bark, or chunks. The man watching for falling material should select a location facing the fallers so they can observe any warning sign, and preferably he should be in a reclining position so as to relieve neck strain.

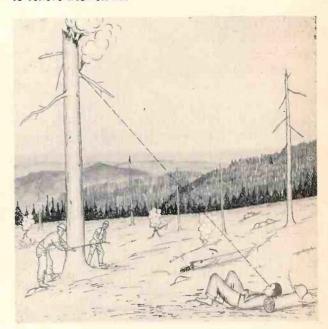


Fig. 6—Three-man falling crew—third man watches for safety of fallers.

If one man is alone on the fire, or no saw is available, it will be necessary to chop the snag down with an ax or Pulaski. Even large snags can be chopped down. When the snag has been felled, the same action should be followed as for burning logs. Cool hot spots with clean dirt. Dig a fire line around the ground fire. Extinguish each piece of burning material and place in the boneyard. A thorough search should be made for spot fires that may have been started by sparks from the snag. All snags that are afire should be cut down or, if the fire is near the ground and water is available, it may be possible to extinguish it with a backpack pump can without felling the snag.

When felling a snag, every precaution must be taken to avoid injury from loose bark, burning limbs or partially burnt off tops that may become dislodged by the shock of the ax or from pounding on the wedge. Loose bark that is within reach can be removed with a strong pole with comparative safety, provided it is pried loose from an angle.

Care must be exercised to avoid having the stick act as a skid to direct the bark toward the person using it. Often the greater part of the sawing or chopping can be accomplished on the side away from falling brands or dangerous limbs. Sometimes it will be necessary to wait until the burning snag has cooled down and the loose and dangerous bark, limbs and tops have dropped to the ground before attempting to fall the snag.

How to Put Out Small Fires in a Stump

If a large stump is burning and the fire has spread to the ground, the fire should be looked over to decide where to begin work. Hot spots should be cooled down with a few shovelfuls of clean dirt. If fire is spreading on the ground, a fire line should be quickly dug around it to prevent further spread.

Work should then be started to extinguish the fire in the stump. The burning portions should be scraped off, chopped out, or put out by rubbing with damp dirt. Water should be used if available. Chopping should be done carefully so as not to scatter burning chips. Fire in the roots should be dug up and the burning roots chopped off so the fire can be put out. Use the boneyard. The ground fire should be put out the same as in litter and duff fires. All parts of the fire should be worked on until every spark is out. Determine this by feeling all the burned places with the hands.

How to Put Out Small Fires in Grass

Grass, principally "cheatgrass," covers large areas in the low country east of the Cascade Range and sometimes in openings bordered by timbered areas. It cures or dies in the early part of the summer and becomes very dry. Dead grass is very susceptible to changes in weather. It dries out or absorbs moisture rapidly. Changes in air moisture are quickly reflected in the way grass will burn.

Dry, dead grass ignites easily from a small spark. It is one of the fastest burning fuels, particularly where it grows thickly. Grass fires usually do not burn very hot, and they soon cool down. Unless quickly controlled, a fire may cover a very large area in a few hours. This is particularly true if either wind or slope, or both, are present. These characteristics make it highly important that the most dangerous points be determined immediately upon arrival of the first firefighter. Work should

start at once on the most dangerous point. Continue to control progressively the next most dangerous point until the fire is out.

A grass fire may be controlled by use of clean dirt applied with a shovel to smother the fire. A fire line may also be used, or a wet sack, a green tree branch or a swatter by working directly at the fire's edge. If a fire line is used, it should be dug to clean dirt in the manner described under litter and duff fires. Any unburned material between the fire line and the fire edge should be burned out under the direction of an experienced fireman or leader.

When working on the fire edge with a wet sack, branch or swatter, use a downward sweeping stroke directed toward the fire to avoid throwing sparks into unburned area. Hesitate slightly at end of stroke. This tends to smother the fire. Keep an eye on the edge already worked to see that some smoldering spark does not come to life. How to Put Out Small Fires in Ferns or Weeds

Ferns and weeds cover large areas in old burns, cutovers and hilly ranches. They make a rank growth each year and then die. In late fall, or early spring, the accumulation of dead plants soon becomes dried out. Spread of fire is rapid, and fast fire fighting action is necessary. A fire in these fuels, when logs, brush or trees are absent, resembles a grass fire, but there is usually a greater amount of flame and smoke. Work directly on the edge of the fire. Dirt can be spread at the base of the flames with a shovel to cool down the fire and make it possible to work close to it. Water from a backpack can may be used for the same purpose. Scrape the burning material at the fire edge in to the fire. When the fuel is dense or mixed with rotten wood, logs, brush or trees, clear a strip ahead of the fire and dig or scrape a fire line to clean dirt. A hoe is effective for this purpose. Work close to the fire and work fast. The fastest spreading spots should be stopped first. Then work around all the edge of the fire. Then mopup by extinguishing all fire, beginning at the outside and working in.

Ferns and weeds are flash fuels which do not burn very long. Therefore, a fire in them can be mopped up quickly. However, there are usually rotten wood, snags, stumps, logs, or other heavy fuels present, which require considerable work to mopup and put out.

How to Put Out Small Fires in a Mixture of Fuels

A fire often burns in or around several fuels, such as duff and litter, logs, small trees and snags. In such cases it is especially important to quickly size up the fire to determine the danger points and plan the attack. Remember the danger points are the parts of the fire that are causing, or are likely to cause, spread.



Fig. 7—Danger points listed in order of priority: (1) Burning log on side of fire subject to greatest spread, (2) Sparks from burning snag, (3) Low hanging limbs extending over fire edge, (4) Moss-covered limbs extending over fire edge but on back side of fire, (5) Burning log subject to roll, and (6) Fir reproduction on fire edge.

Do just enough work at the start on each danger point to stop spread or the threat of spread, then systematically extinguish the fire as outlined in the above paragraphs.

GOOD PRACTICES IN FIGHTING ALL SMALL FIRES

- 1. Waste no time hunting for or packing water for initial attack on a fire—it won't wait for you.
- 2. Damp clean dirt is as good as water for knocking down fire; slap it on hard with a sweeping motion. A twist of the shovel handle will spread the dirt and assist in smothering the fire. Many a hot fire has been made safe by one man by the vigorous throwing of dirt.
- 3. Dig or scrape a fire line as close to the fire edge as possible. In any event, do not leave unburned material between fire edge and fire line—burn it out, dig it out, or build a new line closer in. A fire line may need to be 4 inches wide or 4 feet wide to prevent the ground fire from spreading across from the heat or flames. Width required varies with the ground fuels, topography, and weather. Do not dig or scrape wider than necessary—strive for length, not width and quality. More fires are lost for lack of length than because of the quality of the fire line.
- 4. Where logs lie across the fire line, chop off a 2- to 3-foo sect on of the bark and rotten wood and clear out a hole underneath. Cover the top with dirt to prevent fire from burning across until all the fire is made safe. If a log is rotten or small, cut out a section at least as wide as the fire line.
- 5. The final clearing line through small trees and brush should usually be as wide as the height of the material cleared. Width should vary with the fuel, topography, and weather.

- 6. Burning or charred material should be thrown into the fire. On small fires the unburned material is thrown out, but when building fire line on the upper side of a steep slope, it may be easier to throw and scatter the unburned material well into the fire.
- 7. Keep a close watch for spot fires. They may spread more rapidly and cause more trouble than the main fire if unattended. After extinguishing a lightning fire, select an opening or climb a tree and look around before leaving—another fire may be discovered as lightning often strikes in two or three nearby places at the same time.

MOPPING UP

All fires are potentially dangerous until they are dead out. The object of mop-up work on small fires is to put them out as quickly as possible. It is usually faster and safer to extinguish a small fire piece by piece and part by part than to wait for it to burn out. Waiting around for fuels to burn up has caused more than one firefighter who has had his fire under control to lose it when the weather changed.

A dead fire is a safe fire

Give first attention to:

- 1. Separating burning materials to reduce heat.
- 2. Rolling burning logs and chunks out of their hot beds and exposing burning portions to the air.
- 3. Chopping burning pockets out of logs, stumps and roots.
 - 4. Trimming low branches off trees in or near the fire.
- 5. Keeping fire out of reproduction, trees and snags by throwing on dirt and by scraping away and removing all nearby burning material.

Do the above five things, and the job will be a lot easier and quicker, and therefore safer.

If there is not room within the burned area to work the fire out of burning material, a nearby large boneyard should be cleared to clean dirt for this purpose. Coals can be scraped off burning chunks and mixed with clean damp dirt on top of the ground. Rub any remaining fire from each piece with dirt until it can be handled with the bare hands. Lay the pieces parallel in the boneyard so they don't touch each other.

After the burned surface materials have been disposed of, next give attention to beds of hot embers and fire smoldering in the duff. These materials should be mixed and remixed with clean dirt much the same as spading a garden. The stirring must be continued until no hot materials or coals can be felt with the bare hand.

If water is readily available, it can be used to good advantage in mop-up work. Hot sticks or small chunks can be dipped in water or the water may be used to form

a mud puddle. With a backpack can, water should be pumped in hard to reach pockets in logs and stumps. To be effective, water must be placed directly on the fire. This can be done by rolling logs and chunks over to expose the fire. Burning duff should be dug out with a hoe or shovel before applying water.

The fire should not be abandoned until every spark is out and a search has been made within a reasonable radius to see that no spot fires are burning. Make a second check to be sure.

SAFE PRACTICES (The safe way is the best way)

- 1. Avoid passing a dangerous burning tree or snag on the downhill side; do not lie or sit down within reach of one.
- 2. Keep alert for rolling rocks or logs on steep hills. If you hear one coming, don't run blindly. Determine its direction or roll and then get in the clear.
- 3. Clear away all obstructions before chopping. Hold small material with one hand and chop it off with short, well-directed blows. Be sure of your footing and chop away from your legs and feet.
- Apply first-aid treatment to blisters and minor cuts or scratches to avoid infection.
 - 5. Report injuries immediately to your superior officer.

REPORT ON FIRES PUT OUT

The ranger is required to make a complete report on each fire which occurs in his unit. He depends on the smokechaser sent to the fire to furnish him with certain information called for on fire report Form 929. The smokechaser is furnished instructions (Form 10-R6) on the details of collecting this information.

FIGHTING MEDIUM AND LARGE SIZE FIRES

Not all fires will be suppressed while small. In spite of speedy attack, application of best known methods, hard work, and determination on the part of the fire control forces, some fires may become large. A fire of this kind presents many problems not encountered on smaller fires. Suppression of medium and large fires requires knowledge of fire behavior, fire organization, and fire fighting methods and techniques far in excess of that furnished on suppression of small fires.

The purpose of the following pages is to state facts and principles and describe methods developed during years of experience in handling medium and large size fires. Because fires occur under greatly varied conditions, these principles can serve only as guides. Good judgment and resourcefulness are necessary in applying these principles to particular situations.

FIRE BEHAVIOR

The principal factors governing combustion and rate of spread of fires in any given cover type (timber, brush, old burns, grasslands, etc.) are: (1) fuels, (2) fire weather, and (3) topography. In the material which follows, these three factors have been dissected and the several subjects pertaining to them discussed in detail. On account of the inter-relation of some of these subjects, it has been necessary to take up certain of them under each of the three main headings.

Success in fighting a fire depends to a considerable extent on being able to anticipate the burning conditions of the future as well as to recognize those of the present. In order to be on top of the situation, the firefighter must keep himself informed of the variable as well as the fixed factors which determine fire behavior. Good scouting will reveal the kind, quantity, and arrangement of fuels, the topography and aspect and the relation of these to each other, while fire weather forecasts and data from fire danger stations will show the trend of climatic changes. General analysis of the interplay of these several variable and fixed factors will indicate what changes in control procedures will be necessary.

Fuels

Two main groups of fuels are present on most fires. There are the logs, large branches, poles, and standing snags and timber in one category and the duff, litter, herbs, twigs, and small branches in another. While the former are important in that once ignited they create an enormous volume of heat, yet fires will seldom start and spread rapidly unless the latter kinds of fuels are present in sufficient quantity to provide kindling. Also, the larger fuels may not burn readily until a prolonged period of extremely dry weather has occurred, while the finer fuels, following even a few hours of low humidity and dry winds, will become dry enough that a fire will spread with great rapidity. Hence the latter group of fuels is entitled to first consideration.

1. Flash fuels are termed critical, since under normal conditions they may become susceptible to ready ignition and rapid combustion. Some of the most common dead flash fuels are: the top layer of forest duff; fallen needles of coniferous trees, especially those of the most resinous species; the light litter of twigs, small branches, dead leaves, and dead herbaceous growth; tree moss; and the outer crust or shell of heavy limbs, logs, snags, and the outside or dead bark of coniferous trees. In addition, there are live fuels which are extremely flashy when subjected to the rapidly drying intense heat of burning dead fuels. Some of the most commonly encountered live flash fuels

are: needles of coniferous reproduction, salal, ceanothus, sagebrush and bitterbrush.

2. Slow-burning fuels, which because of their size, structure, or exposure, are slow to dry out and become inflammable. Such fuels as windfalls, deep duff, stumps, and large chunks fall in this class. When dry, they ignite readily and will throw off considerable amounts of heat, yet there is nothing of the nature of a flash fire in their make-up. Clean burns, in which virtually all the burnable material is consumed, occur when these fuels have been thoroughly dried out.

Quantity of fuels

The amount of fuel is a determining factor in rate of spread. An increase in the amount of flash fuels increases the rate of spread and makes a hotter fire which results in greater damage. Quantity of fuels is also a determining factor in the units of work necessary to control a fire.

Arrangement of fuels

If the fuels are flattened on the ground in massed volume, there is reduced circulation of air, which results in their retaining moisture for longer periods than fuels which are distributed loosely. The impeded air movement naturally prevents quick combustion, since that chemical process is dependent upon adequate supplies of heat and oxygen. The effect of fuel arrangement can be illustrated with a bale of hay. Before the wires are loosed, the ignited hay smoulders or burns very slowly because of lack of oxygen in the compact mass, but when the wires are loosed and the hay is shaken up with a pitchfork, it burns rapidly.

Dead cheatgrass and bracken fern are excellent examples of fuels which are arranged in an optimum condition for quick combustion. Piled logging slash is a good example of an arrangement which slows up combustion, since not only is the fuel compressed and flattened by its own weight, but the areas free of debris between the piles tend to confine the fire to individual piles.

Fire weather factors and effects

Several inter-related weather factors are discussed in order that their net effect on the inflammability of fuels and fire behavior in general can be understood. No one factor taken alone is responsible for a given moisture content or for fire behavior at any particular time, but certain factors are believed to be more important than others.

Fuel moisture

In fighting fires, it is necessary to consider the effect that weather has had on the forest fuels. A given fuel moisture content is the cumulative effect of all fire weather factors.

The amount of moisture in forest fuels, particularly in the finely divided flash fuels, largely determines in conjunction with wind, whether fires will start, and if started, how they will behave. In general, fuels containing over 25% of moisture are considered non-inflammable, while fuels with 25% or less are inflammable and become increasingly so as moisture is evaporated below this point.

The trend of forest fuel moisture content is obtained by measuring the moisture content of fuel indicator sticks at fire danger stations. The fuel moisture indicator stick values at fire danger stations will not be exactly the same as those of nearby surrounding forest fuels, but day-to-day changes in fuel stick values will be accompanied by similar changes in forest fuels exposed to the same sequence of weather conditions. Prolonged low fuel indicator stick values will usually indicate critical burning conditions.

Fuel moisture indicator stick measurements are taken where full sunlight is available for the longest period of the day. Such measurements will, therefore, show drier fuels than exist under varying degrees of shade, because fuels absorb extra heat from the direct rays of the sun and become much hotter than the air. The additional heat causes more evaporation than would occur as a result of the general atmospheric dryness alone.

In order that a general rule of thumb will be available, the following diagram is presented:

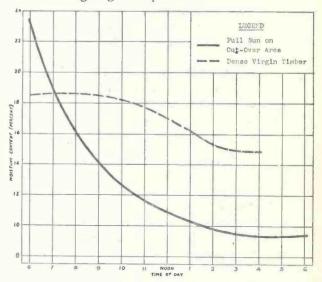


Fig. 8—Average daily change in moisture content of fuel moisture indicator sticks exposed under different cover conditions at Wind River Experiment Station. Applies particularly to West Side forests; East Side conditions would have same relationship only less spread between the two extremes of shade and no shade, Chart, therefore, merely illustrates a principle.

Under normal conditions, forest fuels recover moisture between the 4:30 p.m. reading and the 8:00 a.m. reading on the following day. The amount of this recovery varies between fire danger stations, depending principally on the climate. By following the trends of fuel moisture between these two readings, the normal recovery at each fire danger station can be readily ascertained. It will be found that the recovery varies during the fire season, and it is important that the fuel moisture recovery trends at the several fire danger stations be carefully observed.

The departure from the normal fuel moisture recovery at any fire danger station, either plus or minus, is one index in the trend of fire behavior. If recovery is less than normal, the fuels may be expected to drop to a lower moisture content than on the previous day; if greater than normal, the fuels may be expected to rise to a higher moisture content than on the previous day. The number of successive days with recovery above or below normal should also be observed, since each additional day materially aids or aggravates the fire behavior situation.

Soil moisture

The amount of moisture in the top soil has an important effect on the moisture content and consequently the inflammability of fuels. This effect on fuels is much the same as that on blotting paper when it is placed on a damp surface. In the spring, when the top soil is wet, the fuels have a high moisture content, but as the summer season advances, the gradual warming of the earth's surface and the prolonged periods without precipitation reduce the soil moisture available for absorption by the fuels and, therefore, their inflammability increases. After forest fuels and soil have been thoroughly dried out, prolonged precipitation or high humidity are necessary before sufficient moisture is absorbed to definitely alleviate the fire danger. (The effect of initial rainy spells on probable fire behavior should be properly evaluated by the fire boss. It is best not to relax control efforts on a fire because of favorable fire weather; rather, control line construction and mop-up should be pressed with renewed vigor, so that such favorable breaks in the weather will be utilized to the fullest possible.)

Relative humidity

Relative humidity is the percentage of moisture present in the air at a given temperature compared to the amount that would be present at the same temperature if the air were fully saturated.

Relative humidity is one of the most important easily measured factors which determine fire behavior. However, it cannot be used as a complete index of probable inflammability of fuels nor of how fires will behave. Its importance lies in the fact that it is an index of trends to be expected in the combustibility of fuels and consequent fire behavior. If the relative humidity remained constant long enough to allow fuels to come into equilibrium with the moisture content of the atmosphere, fuel moisture would be more closely associated with a given relative humidity.

However, this is seldom the case, which explains why relative humidity and fuel moisture content are generally not in correlation.

In fire fighting, relative humidity is of prime importance in connection with such specialized operations as backfiring, burning out, and firing tree moss, since extremely flashy fuels quickly react to sudden changes in relative humidity. This is a fact which many experienced firefighters have learned through bitter experience; hence it is good practice on a fire to keep constantly informed as to the relative humidity changes.

Tem perature

The chief effect of temperature on combustion is that an increase in air temperature causes a decrease in relative humidity, which in turn results in faster evaporation of moisture from the fuels.

As an example of the importance of this to the fire-fighter, 437 cubic feet of air at 68° F. can hold 7.4 ounces of water vapor, while at 90° it can hold twice as much, or 14.8 ounces. In applying this to forest conditions, assume that during the early morning the air contains 7.4 ounces of water vapor and the temperature is 68°. The relative humidity would be 100% and there would be rain, fog, or dew. By the middle of the day, the temperature has increased to 90° and the air still has 7.4 ounces of water vapor. Then the relative humidity will be 50% and the fuels will be rapidly giving off moisture into the air.

Temperature has another effect on fire behavior in that warm air rises and cold air descends, causing drafts. The absorption of the sun's rays by the earth warms the air next to the ground, causing it to rise.

It is a common misconception that temperature has an appreciable direct effect on combustion. Its effect is too small to be of consequence. Fuels must reach 600° to 800° F. before combustion takes place. These temperatures are so much greater than atmospheric temperatures that a difference of even 50° in the air temperature is comparatively unimportant.

Winds

Winds are of two kinds, general prevailing winds and local winds. All winds have two inherent qualities which are intimately related to fire behavior — direction and velocity. To facilitate discussion, these two qualities will be handled separately.

1. Wind direction, for a given forest area, is associated with certain kinds of weather, frequently differing with each of the four general seasons—spring, summer, fall and winter. Thus west of the Cascade Mountains the prevailing general wind direction during the normal fire season of July, August and September is from the

NW, a direction which is associated with clear skies and usually fair weather. But if the wind direction shifts to the E or NE, extremely hot and dry weather occurs and the fuels and soil dry out rapidly. Again if the wind direction shifts to the SW, cloudy, damp weather and sometimes rain results. Hence it is evident that any marked deviation from normal direction indicates definite weather changes and consequently different fire behavior.

The general, prevailing winds largely determine the day-to-day weather for large areas of country. They are caused by uneven heating of the earth's surface at different points. If the topography is such that high mountains do not change the direction of these general winds, there will usually be little shift in general direction for considerable periods of time. However, the greater part of this region is so cut up by rough topography and mountain ranges that the winds on fires are frequently not general but local in character. These local winds are variable, causing no end of trouble to the firefighter and resulting in many peculiar drafts or breezes. Nevertheless they have certain peculiarities which can be counted on with a fair amount of certainty.

For example, local winds have a tendency to blow up a valley or canyon during the day, and down the valley or canyon at night. When such a condition regularly occurs, it has a very definite relationship to fire control measures, and failure to recognize this wind habit may cause disaster. Success in backfiring often depends on these local wind direction shifts.

2. Wind velocity has two important functions in fire behavior: as a vehicle to supply oxygen and as a mechanical force to spread the fire.

When fuels are burned, the supply of oxygen, which is approximately 20% of the composition of dry air, is exhausted and must be replaced or combustion ceases and the fire dies. If there is little or no wind movement, renewal of the oxygen supply is dependent on the air that moves in to replace the hot gases which naturally rise from the fire. Such movement of air is termed draft. However, if some wind movement occurs, in addition to the draft, the oxygen is supplied at a faster rate and the fire burns at a correspondingly faster rate.

Wind exerts its effect mechanically on a fire in several ways:

- 1. It diverts the hot gases rising above the fire from their natural vertical movement to a fan-wise movement, thus producing a hot layer or blanket of air which is diffused on the head and flanks of the fire. This greatly increases the evaporation rate of moisture from the unburned fuels.
 - 2. It literally turns the flames on their sides if it is

strong and bends the flames over the unburned fuels, which accelerates the process of raising the fuels to the kindling point.

3. It carries sparks, embers, and larger burning chunks ahead of the main fire to set spot fires.

In general, it has been determined that, for slopes up to 20%, wind velocity increases the perimeter of a fire in direct ratio as the velocity increases; i.e., a 10-mile wind increases the perimeter ten times as fast as a 1-mile wind, with the fuel moisture constant in both cases. For slopes in excess of 20%, additional allowance must be made.

Topography

Topographic conditions in this region are extremely varied, ranging from rolling plateaus to precipitous ridges and mountains, while between these two extremes all kinds of variations exist. Since topography has a very important bearing on fire behavior, it merits separate discussion.

Aspect

By aspect is meant the direction of slope; i.e., N, NE, E, etc. Thus a slope facing the south is said to have a south aspect. The term, "exposure," should not be used in this connection, as it refers also to wind, sun, and other similar relationships.

Aspects may be both favorable and unfavorable, depending upon the particular relationship involved. Thus north aspects are always damper than south aspects, as they do not receive direct rays of the sun. However, areas with increased moisture usually support more vegetation, hence may involve additional work units to construct a control line. In general, south and southwest aspects are more critical than north and northeast aspects so far as fuel moistures are concerned.

Draft

In its simplest sense, without introducing wind velocity, a draft is any natural movement of warm air. The natural rise of warm air is in a vertical direction. This principle is illustrated by the sketch (Fig. 9) of a fire burning on level ground. On sunny days during the fire season warm air is rising almost continuously from the surface of level ground. Hence natural drafts are present at all times during warm weather, and the introduction of fire on a given area merely accelerates the natural draft.

As warm air rises, it is replaced by cold air, thus creating, in a literal sense, a revolving movement of the atmosphere which is termed convection. This movement may be very slight on steep slopes, or it may be of such magnitude that the draft set up may be erroneously termed wind.

To acquire a thorough knowledge and understanding of how drafts, in conjunction with topography and wind velocity, affect the behavior of forest fires is most difficult without considerable experience. It is possible through a study of the sketches in this text and the description of each sketch to grasp the fundamental principles, so that as opportunities to study actual fires occur, the very best use can be made of the experience. Following is the legend for these sketches:

LEGEND Fig. 9, 10, 11, 12 & 13 Prevailing wind Inrushing cold air Rising hot air Sparks

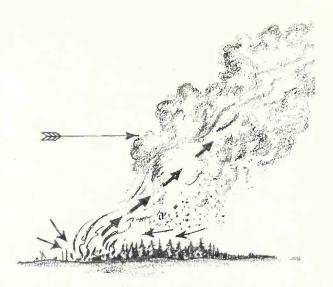


Fig. 10—Fire burning on level ground, hot gases deflected from normal vertical position by wind, thereby accelerating the spread of fire.



Fig. 9-Fire burning on level ground, draft vertical.

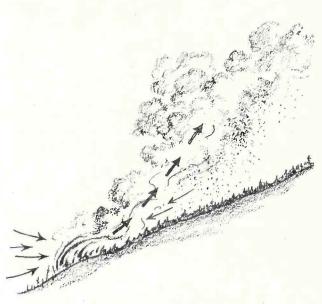


Fig. 11—Fire burning on slope and spreading as result of draft plus slope.

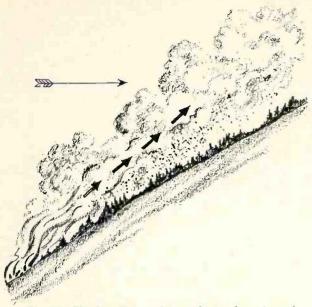


Fig. 12—Fire burning on slope and spread accelerated by wind.

Figure 12 illustrates a fire burning on a slope where the draft occasioned by the slope and fire is further accelerated by wind. Note that the flames are literally turned on their sides, enabling the unburned fuels ahead of the fire to be quickly brought to the kindling point, thus speeding up the rate of spread. In addition, the hot gases are spread over a wider area, drying the fuels and accelerating horizontal spread of the fire.

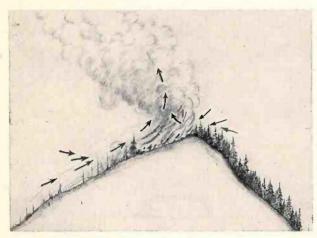


Fig. 13—Effect on fire of uphill drafts.

Figure 13 shows a fire burning up one side of a ridge.

As the fire reaches the top of the ridge, the natural daytime up slope surface draft on the far side of the hill,
plus the weight of the cooler air on that side at all levels
above the height of the ridge, tends to push the hot air
of the fire back over the fire area.

Exposure to wind

If a fire occurs on a steep wide hillside, the force of an

up slope wind tends to turn the flames toward the unburned fuels and, in combination with the draft, tends to drive the fire uphill. The steeper the topography and the greater the exposure to the direct force of the wind, the faster the fire will spread, other things such as fuel moisture being equal. A fire on flat topography can be more readily controlled if the wind velocity is low, but control is more difficult if the wind velocity is high.

By the same reasoning, when broken topography occurs, the fire control problem is increasingly aggravated by the diversified drafts created and the tendency of local winds to become quite variable in their direction. The natural drafts near the ground are usually down the slope at night but will not be very strong except in gullies or valley bottoms.

Fire habits

It can generally be expected that the worst burning period of the day will be between 10:00 a.m. and 5:00 p.m. Under normal conditions fires die down after 6:00 p.m. and are more susceptible to control. During the night, fires usually spread the least, but they pick up gradually after sunrise. These changes are usually due to variations of the relative humidity and fuel moisture content. In some localities local winds spring up and blow quite hard at fairly definite periods of the day. Variations in fire behavior are often largely dependent upon these winds and their directions. The volume of heat also has a distinct effect on the behavior of a fire. For example, weather conditions may be as severe at noon as at any time on a given day, but the fire, steadily increasing its volume of heat, does not reach a conflagration stage until 4:00 p.m. Under the most critical conditions all signs apparently fail, and a fire may crown and spread rapidly throughout the night. Fires have also burned fiercely all night and through the early morning, then, because of reduction of critical fuels or a change in the weather, have quieted down in the afternoon.

Success in fire suppression depends largely on being able to recognize and anticipate the factors that have these effects on fire behavior.

FUEL-TYPE MAPS

To facilitate the use of data available on the kind, quantity, and arrangement of forest fuels, fuel-type maps have been made for all national forests. They show, on the basis of standards set up, the rate of spread and resistance to control to be expected on any given area. Fire bosses should make full use of these fuel-type maps.

Rate of spread

Four rate-of-spread classes are recognized, as follows: Low (L), Moderate (M), High (H), and Extreme (X). Each class represents the combined effect of the following rate-of-spread factors: (a) volume and arrangement or fine fuels, (b) degree of exposure of the fuels to the sun, (c) the normal wind velocity and the degree of exposure of the fuels to the wind. Recent measurements of the rate of spread of fires under average bad fire weather conditions, show that fires in fuel types that have been mapped correctly as moderate will have a perimeter rate of spread about five times as great as fires in types mapped as low. Similarly, fires in fuel types mapped as high will spread about five times as fast as those mapped as moderate, and fires in extreme types spread five times as fast as fires in high types.

In other words, the rate-of-perimeter increase in different types will be represented by 1, 5, 25, and 125. These numbers are merely ratios and should not be mistaken for actual chains of perimeter increase per hour. As a matter of fact, the rate-of-perimeter increase in a low fuel type is not one chain per hour but may range from 1/4 to about 6 chains per hour. In a moderate fuel type it may range from 7 to 30 chains, in a high fuel type from 31 to 150 chains, and in an extreme fuel type from 151 chains up to 700 or more chains per hour. If spotting ahead occurs, the actual fire perimeter may increase even faster.

Resistance to control

Although not a factor influencing fire behavior, resistance to control is included here because of its relationship to fuel-type maps. Four degrees of resistance to control are recognized, as follows: Low (L), Moderate (M), High (H), and Extreme (X). Each class represents the units of manpower required to control a unit of fire perimeter, and the classes are in relationship to each other as follows: Moderate, twice as much work as Low; High, four times as much work as Low; and Extreme, eight times as much work as Low.

FIRE FIGHTING ORGANIZATION AND RESPONSIBILITIES

Where even a few men are working on a fire, the best qualified person is placed in charge. He is the fire boss and is responsible for directing the combined efforts of the crew or crews in controlling the fire.

Twelve to twenty firefighters make up an average size fire crew. If one crew of this size is sent to a fire, the foreman in charge is the fire boss. If fifty men were needed on a fire, the fire boss in charge should divide and organize his men into three foreman crews. On large fires, a sector boss is placed in charge of two to three foreman crews. As the size of the fire and number of crews increase, the fire boss will place a division boss in charge of two or three sector bosses.

Scouts are required on medium and large-size fires to secure information for the fire boss. On medium-size fires

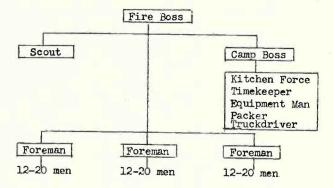
where only one or two are employed, they will report direct to the fire boss. On large fires employing several scouts, they will work under a scout boss who will report to the fire boss.

On many large fires one or more fire camps are established, and the camp work is usually supervised by a camp boss who works under the general supervision of the fire boss on medium-size fires or the division or sector boss on large fires. In a large fire camp, the camp boss may have several assistants in charge of activities such as: (1) time-keeping and commissary, (2) checking and repairing fire tools and equipment, (3) dispatching trucks and pack strings, (4) first aid and sanitation, and (5) food supplies, including preparation of meals. In a small fire camp, the camp boss may handle all these activities or he may be assisted by a timekeeper and cook.

Medium-size organizations

On medium-size fires the overhead is often composed of guards, forest crews, and cooperators, with the ranger as fire boss. The crew is usually made up of Forest Service improvement crews, organized industrial crews, or cooperative units. A great deal of fire fighting experience is represented, and an elaborate plan of organization is not necessary. The overhead ordinarily are familiar with the individual qualifications of the men, and assignments can readily be made to such specialized jobs as operating tractors and pumps, falling, and burning out. The duties of the overhead positions are similar to those on a large fire, but the duties of several positions may be combined.

The following chart shows the lines of authority for a medium-size organization:

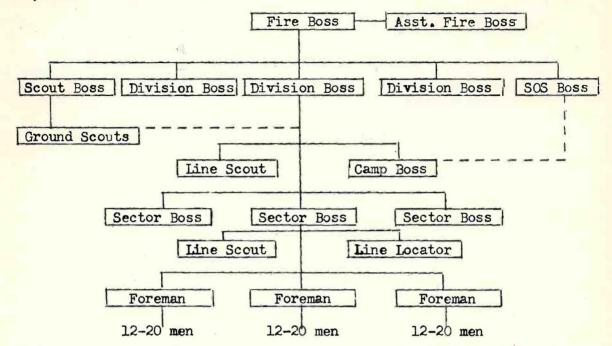


Large-size organizations

On large fires the overhead may not be familiar with the qualifications of the men in their crews, and the crews may be totally inexperienced in fire fighting. Organization is extremely important under these conditions. A carefully planned system and trained overhead are essential to avoid confusion, loss of time, and general inefficiency. For details on scouting and service of supply work, see Part III, Chapters 3 and 4, Fire Control Handbook.

The following chart and Figure 14 show the fire line organization on a large fire, which should be modified to fit the particular condition encountered on each fire:

crews that he will not have to give direct instructions to more than about six men, even on a large fire. These men may be the assistant fire boss, the division bosses, the



Following are the responsibilities and functions of the various fire line organization positions. Service of supply and camp boss activities are set forth in another chapter.

Fire Boss

The fire boss is in charge of all activities on the fire and has full authority over all branches of the organization. He is responsible to the forest supervisor or the district ranger for suppression of the fire within established standards and with a minimum of damage and expense. He must be thoroughly familiar with the fire suppression policy, methods of calculating fire suppression needs, and fire suppression organization; and he must understand and intelligently use modern fire fighting methods under the existing weather, topographic, and fuel conditions. He should also be familiar with tractors, plows, pumpers, and other special fire fighting equipment, and be able to recognize where such equipment can be used effectively.

He will (a) assemble facts and information from maps, scouts, division bosses and personal checks, and determine the plan of action, (b) organize men and resources, assign responsibilities and issue instructions for executing the plans, and (c) check on results and coach his leaders as required in fire fighting organization, fire strategy, methods and technique.

The fire boss should so organize his overhead and

scout boss, and the SOS boss, if the fire is large enough to require these positions. On medium-size fires they will ordinarily be the foremen, scout, and camp boss.

Experience has demonstrated that most of a fire boss' working time should be spent on the line checking results and coaching his leaders. During his rest periods, the assistant fire boss, or other designated forest officer, if no assistant is used, should have charge of the organization and assume full responsibility.

Adequate use of the scouting organization will enable the fire boss to keep informed of conditions on the fire so that he can take the most appropriate action. A good communication network will be of great assistance in receiving information and transmitting instructions.

A reminder list of principal duties for the fire boss is contained in the Fire Fighting Overhead Notebook. The following are some good practices requiring emphasis that should receive the personal attention of the fire boss:

- 1. Hold short early evening meetings with *available* key overhead, so that all reports can be received and instructions for the next day issued at one time.
- 2. Arrange for an uninterrupted communication schedule in the evening with key overhead in charge of line camps where it is not practical for them to attend the evening meeting to discuss and plan the next day's work. When radio is used for communication, static and local

interference will sometimes make evening communication impractical, in which case an early morning schedule should be arranged for the purpose of obtaining information on the plans made the previous evening by the overhead in charge and to give such instruction as appears necessary to secure proper coordination of efforts.

- 3. After the evening meeting, insist on overhead getting rest.
- 4. Adequate general scouting must be provided. Night scouting should also be provided where night progress of fire may require a change in planned strategy and arrange to have this information not later than at breakfast time.
- 5. Keep camps small, usually not over 200 men, and locate them close to the fire line wherever possible, so as to reduce the fatigue factors associated with long delays in larger camps, feeding, equipping, and hiking or transporting men long distances to fires. Feed and rest men on the line when possible.
- 6. Plan to spend the larger part of working time on fire line supervision, giving first consideration to critical points.
- 7. Insist on coaching, from the division boss down, in application of fire control technique and in safe working conditions.
- 8. Anticipate the potential spread of the fire and plan accordingly. Water and camp possibilities and routes of travel should be scouted in advance of actual needs.
- 9. When on the line, make full use of line camps and fire line radios to keep in touch with all operations on the fire, including the base camp.
- 10. Make full use of a saddle horse and messenger to conserve energy. Often fire bosses find it worthwhile to have a messenger with them at all times on the fire line to do much of the "leg" work.
- 11. Insist on night work where practical. Insist on the first day shift being on the control line at daylight.
- 12. Important instructions should be given in writing, such as assignment of responsibilities, initial starting point of control line, and the day's objective. For other instructions, such as may result from discussion and field checking, there are many advantages in having the recipient make his own written notes. Insist on use of the Fire Fighting Overhead Notebook for showing organization, drawing equipment and lunches, for transmitting messages, and for self memorandums.

Assistant fire boss

The assistant fire boss on larger fires assists the fire boss in organizing overhead and crews, relieves him for rest, or may be assigned a portion of the fire involving two or more division boss units.

Division boss

The division boss is responsible for all activities on a division of or certain functions on a fire. He works under and is responsible to the fire boss for the accomplishment of assigned objectives, which is usually the control of the me between designated topographic or cultural features, such as ridges, streams, roads, or trails. He must have a thorough knowledge of line and camp duties on large fires as well as Forest Service objectives and standards in fire suppression work, organization, and lines of authority.

The principal duties of the division boss are to (a) organize available overhead, manpower and equipment for construction of fire control line and usually the establishment of a fire camp, assign responsibilities and issue instructions for job accomplishments, (b) check on results, and (c) coach the sector bosses, as required in control line organization, fire fighting methods, and technique, and the camp boss in fire camp organization and duties.

He should organize his overhead so that he will not have to give direct instructions to more than three sector bosses, a camp boss, and one or two line scouts. The division boss should spend his entire time during working hours on the control line and should plan to be at the most critical point during blow-up hours of the day.

A reminder list of principal duties of the division boss is contained in the Fire Fighting Overhead Notebook. The following are some good practices requiring emphasis that should receive the personal attention of the division boss:

- 1. Be prepared to furnish a concise report to the fire boss when called for on accomplishments and needs of the division. Make use of good scouts to keep informed.
- 2. Instruct sector bosses and camp boss, in writing, in the evening on general plans for the next day or shift, particularly as to morning arrangements.
 - 3. Secure rest.
- 4. Use a messenger or a saddle horse, if available, to save all of the "leg" work possible.
- 5. Eliminate all needless fatigue-producing factors. Insist on—hiking men shortest possible distances, prompt mess service (use two or three mess lines if necessary to avoid having men stand in line for long periods—more than 20 minutes), efficient equipment service, and having men sit down when riding in trucks.
- 6. Insist on sector bosses coaching their foremen in fire fighting technique, on-the-job training, and safe working practices.
- 7. In mop-up work, the sector boundaries should be marked on the ground to avoid misunderstanding.

Sector boss

The sector boss works under the direction of the division boss on large fires and may work directly under the fire boss on medium-size fires. He directs the work of all foremen assigned to him—usually two to four foreman crews. He may also supervise the work of the camp boss if a fire camp is located on his sector.

A sector boss may be responsible for controlling the fire on one side or sector of the fire, including all phases of control line work, or he may be assigned supervision of two or more foreman crews in a large functional crew organization or to take charge of mop-up work on a sector of the fire.

The sector boss must have a thorough knowledge of fire behavior, fire organization, particularly foreman-crew organization, fire suppression methods and techniques, mop-up, job training, and safe working practices.

A reminder list of principal duties of the sector boss is contained in the Fire Fighting Overhead Notebook. The following are some good practices requiring emphasis that should receive the personal attention of the sector boss:

- 1. Insofar as practical, organize the firefighters into foreman crews based on their qualifications and ability to use cutting tools, digging tools, torches, shovels, saws, and special equipment.
- 2. Make necessary adjustment in foreman crews and issue foremen written instructions in the evening for the next day's work. Use Fire Fighting Overhead Notebook.
- 3. Make over-all arrangements with the camp boss in the evening as to needs and time for transportation, equipment, lunches, and water for use next day, to insure that first-day shifts will be on the fire line at daybreak.
- 4. Hold foremen responsible for keeping track of each member of his crew at all times—always bedding down with his crew in a designated location—preventing stragglers from getting lost while traveling to and from fire line—keeping time—first-aid treatment of minor injuries—sanitation.
 - 5. Secure rest.
- 6. Coach foremen, as required, in suppression and mop-up techniques, crew organization, and particularly in how to handle on-the-job training of crew members, including safety. Be alert to the training needs of inexperienced men. Require foreman to give at least minimum instructions to inexperienced firefighters in spacing, carrying and using tools, and safe working practices before attempting control line work. Individual instruction can best be determined and given by the foreman on the job.
- 7. Burn out fire line promptly. Do not take credit for completed control line until burned out.

- 8. Recognize hazardous conditions and decide on ways to alert the foremen.
- 9. In advance, plan on moving crews to a safe location in case of a blow-up.
- 10. Use "bird dog" type of scouting to keep informed on immediate location and progress of fire and make full use of a line locator if in charge of the lead crew. Save your own energy for supervision, training, correlating foreman crews, and checking accomplishments.
- 11. Arrange to have first-aid personnel and supplies
- 12. Sector bosses in charge of patrol and mop-up should mark boundaries on ground or make definite arrangements to insure that all line is being covered.
- 13. Important instructions to foremen should be made in writing, supplemented and amplified as necessary orally—Use the Fire Fighting Overhead Notebook.
 - 14. Provide for spot-fire hunters as need requires.

Foreman

On large fires the foreman works under the sector boss and supervises the work of crew members on functional control line or mop-up work. Usually the foreman is assigned to a specific job, such as clearing, line construction, burning out or backfiring, holding, use of water, use of tractor and plow unit, snagfalling, or mop-up.

In order to carry out any one or a combination of the above outlined jobs, a foreman should have a good working knowledge of fire behavior, fire suppression and mop-up techniques, and the ability to organize his crew in a manner to obtain maximum production on the job. A detailed explanation of technical knowledge and skills required will be found in this chapter, and a reminder list of foreman duties is contained in the Fire Fighting Overhead Notebook. The foreman should provide himself with a copy of the Fire Fighting Overhead Notebook and a timebook immediately upon arrival at a fire.

The foreman in charge of a fire crew has a dual responsibility (1) for securing a fair day's work from each man in his crew and (2) for looking after the safety and welfare of his men. To secure a fair day's work, the foreman must size up and shift assignments within his crew so as to get a maximum of production from each man's efforts. Tryout on the job may reveal the need for reassignment to a job in another crew, in which case the foreman should notify the sector boss. Frequently crew members' efforts can be made more effective by on-the-job training, in which event it will be necessary for the foreman to take a few minutes to demonstrate and explain the job and to correct errors before they result in an injury.

At the most appropriate time at a place free from distraction, and before commencing work, the foreman

should take a few minutes with inexperienced men to stress Safety Rules contained in the Fire Fighting Overhead Notebook and also printed on the back of the Firefighter's Contract. He should stress the personal responsibility for observance of each rule. Sincerity and forceful presentation in not to exceed five minutes will make a deep impression. After the crew members are issued a fire tool, they should be instructed in how to carry it. Proper spacing while walking should be emphasized. A reliable person should be assigned as end man to guard against crew members lagging behind and getting lost.

On the fire line, potential hazards should be called to the attention of the crew as a whole or to individuals working in a danger zone. Unsafe working practices should be corrected immediately. If job training or reassignment does not correct individual deficiencies, if it is apparent he is a high accident risk to himself and others, or if it is evident he is physically unable to do the job, future trouble and expense will be avoided by releasing such an individual before he has an accident.

A foreman must plan ahead for the next day's work. He should furnish the camp boss with written requisitions for equipment, lunches, water, first-aid supplies, and transportation, and have a definite understanding as to time and location for picking them up. (Use the Fire Fighting Overhead Notebook.)

The time of each crew member should be posted in the timebook at the end of each shift and turned in to the timekeeper or camp boss. To avoid future arguments over

time, the crew members should be informed each day of hours worked.

Members of the crew should be bedded down in a definitely posted area. The foreman must sleep in the same area, and the location of his bed should be made known to the camp boss or sector boss.

During the evening the foreman should check on the condition of each individual's clothing and shoes, and replacements should be provided as necessary. The crew should be instructed on the importance of wearing clean socks and obtaining first-aid treatment for blisters on hands or feet.

Line scout

The line scout works under the direct supervision of the division boss, sector boss, or foreman, depending upon the amount of scouting work necessary. In control line construction work, he will act as a "bird dog" in obtaining information on location of the fire edge ahead of the line locator. He may report to the scouting boss any information he feels would be of general value. A reminder list of principal scout duties is contained in the Fire Fighting Overhead Notebook.

Functional Control Line Organization

Functional organization for control line construction has been found to be the most effective system of organizing men to obtain their maximum output of held line. It has been tested under various conditions of cover type and topography, and its use is standard practice.

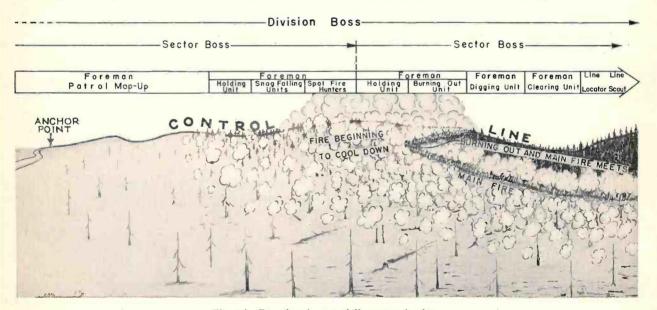


Fig. 14—Functional control line organization.

Under this method, each crew within a functional unit continually progresses forward at the same rate of speed as the lead crew and at all times stays in the same relative position. Likewise each member in a crew, particularly in clearing and digging crews, maintains his same relative position as the crew progresses forward. As each man moves forward, he does one or more licks of work, then advances one or more steps; the number of licks and steps being governed by the amount and type of work and the number of men engaged with the objective of completing the necessary functional job as the last man progresses forward.

Since the lead crew sets the pace, it is important to keep production at this point to its highest level. The following are a few suggestions for accomplishing maximum speed in control line construction:

- 1. Substitute machinery for hand work whenever possible even though it may have to be supplemented with hand work in some instances. This applies particularly to clearing, digging, and holding work.
- 2. The lead crew should guard against doing too much work. Err on the side of doing too little rather than too much.
- 3. Alternate the crews insofar as qualifications permit since the lead crews work the hardest (clearing to patrolmopup, patrol-mopup to holding, holding to digging, and digging to clearing). If it is not possible to alternate the entire foreman crew, consider alternating individual crew members if by so doing the speed can be maintained or increased.
 - 4. Be sure the lead crews are out first in the morning.
- 5. Sometimes it will be advantageous to purposely delay sending on the line until 6 or 7 o'clock the burning out, holding, and patrol-mopup crews if burning-out conditions are not favorable, and the crews are qualified to rotate with the lead crews.
- 6. Double shift the work if crews are available by working 8-hour shifts or alternating in 4-hour shifts.

Theoretically, under this method, it should be possible to organize men to construct line as fast as the lead man can travel. A practical objective, to the extent of all available resources, is to organize men and equipment to construct control line at a rate of one mile per hour.

Spacing of the men in each crew depends upon the work being done. In clearing and digging operations, the men should work far enough apart so as to not interfere with one another's actions or endanger their safety. Ordinarily the distance will not be less than 10 to 15 feet. In burning out, backfiring, holding, snagfalling, and patrol-mopup, the spacing of the men is governed by the cover type, fuel type, burning conditions, topog-

raphy, and number of men available.

Proper spacing and forward speed of the crews may be regulated by whistle signals or by calls. The best method is to give instructions that each man in each crew must keep far enough ahead of the man behind to stay out of his way but not to move ahead and leave him. The man moving up must not crowd the man ahead. In this way, the speed of the crew is more or less self-regulating. A qualified dependable man should be at the rear of each crew to complete the work. Trained crews are desirable, but crews of inexperienced men can be used successfully, provided available overhead have had training in the use of this method.

The functional jobs of control line construction that require crew action are clearing, digging, burning out, holding, snagfalling, and patrol-mopup. The various steps in organizing crews for these functional jobs are described as follows:

Clearing

The clearing crew is the first functional crew and follows the line locator. When starting, they should press forward and get their spacing on the line before beginning work. In light clearing, a small crew can do the work, but in heavy clearing, a large unit, sometimes more than one foreman crew, may be necessary, depending upon the amount of work, speed of clearing desired, and the total number of men available. Where the clearing is heavy, use of a man to throw brush out of the way, behind every three or four ax men, will greatly increase the progress and eliminate some of the causes of accidents. The size of the clearing crew will not only vary with the qualifications and efficiency of the men, but also will be governed by the number of men required to maintain a reasonable forward movement and still leave behind a cleared line. It is a common practice to equip the last few men in the clearing crew with Pulaskis in order that they may chop when the clearing is heavy or dig when the clearing is light.

Digging

The digging crew or crews follow behind the clearing crew. They should be of sufficient numbers to keep up with the clearing operations and at the same time leave behind a completed fire line. The first few men in this crew may also be equipped with Pulaskis to serve as a balancing unit in the same manner as the last few men in the clearing crew. Men with shovels, as required, should be distributed throughout the crew to throw out the material loosened by the men with digging tools.

Burning Out

The burning-out crew follows immediately behind the digging crew. This crew should be of sufficient size and

so equipped to fire the unburned material adjacent to the fire line at a rate of speed that will keep the work up with the digging operation.

If the indirect method of fire fighting is being used, backfiring will also be a part of the control line construction, but it may be done at a different time than when the clearing and digging operations are conducted. In that case, there would be a break in the continuity of action by a functional unit, but otherwise the same organizational methods would be used.

Holding

Holding is the job of controlling or aiding the burningout fire to burn over the intervening strip between the fire edge and the fire line, cooling down hot material, and moving burning chunks away from the fire line. Organizing manpower for this function to take over promptly and keep up with modern methods of line construction and burning out is difficult and often the key to successful control action.

In light, fast-burning fuels, the amount of work and size of the holding crew will be small, but in heavy dry fuels, jungle types, or in snag areas, there may be two or more crews and the tasks may be more difficult than those performed by the clearing and digging crews. In the latter case, it is imperative that sufficient properly equipped crews be added for holding purposes to insure their keeping up with the crew immediately in front of them.

It takes very close supervision and correlation to effectively manage holding crews and keep them progressing forward in the same manner as other crews. A tractor with bulldozer can often aid the holding crew to push burning logs and hot debris in from the fire line. Members of the holding crew should keep a sharp watch for

spot fires. In thick cover types it may be necessary to assign this job to some crew members in order to keep the work abreast of the crew.

Snagfalling

A falling crew will consist of three men. Ordinarily four to five falling crews should work under a snagfalling foreman. It will not always be practical to organize separate snagfalling foreman units or assign them a specific place in the functional organization. Burning conditions and number of snags might make it more practical to attach one or more falling crews to the clearing, digging, burning out, holding, or even the patrol-mopup crew.

Patrol-Mopup

Behind and taking over the line from the holding crews will be the patrol-mopup and initial mopup crews. The members of the first patrol-mopup crew will usually be spaced at shorter intervals than those in the rear where the fire is cooling down. The patrolmen should be kept moving forward so that they will keep up with the holding crew. They should do preliminary mopup work or encourage the fire to burn out. (Final mopup crews will usually be organized on a station or sector basis.)

Equipment

The usual standard equipment will be used to equip a functional crew. Tools are distributed to men in the line in the order in which they will be needed and in the balanced quantity required by the work to be done. Dual purpose tools are provided to take up slack between crews in varying fuel types. Where machinery can be used, it reduces the number of hand tools needed, especially in the clearing and digging operations.

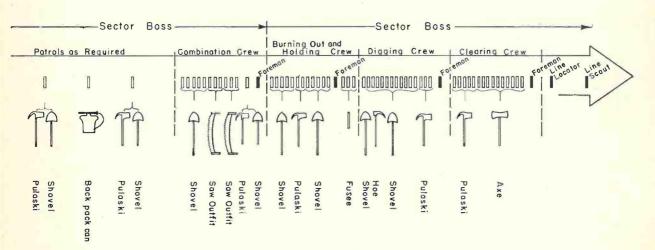


Fig. 15-Equipment distribution in functional control line organization.

Extra tools of various kinds are usually necessary for replacing those broken, for shifting between crew members to have the proper tool available for each particular job, and to have the proper tools to initiate action on a breakover should one occur any place along the line. An extra man or two should be added to the organization to pack extra tools. If machinery is used, provision must be made for prompt replacement of operators and adequate servicing of the equipment so the head end of the organization will not have to slow down or stop.

If light-weight, self-contained outfits (stampede packs) are available, they should be used in inaccessible or rough areas. With these packs the crews can rest, eat, and sleep on or near the line, if that is necessary or desirable, and not have to make fatiguing trips to a fire camp. Plans should be made to keep the packs with the crews by man pack or pack horse. Consideration should also be given to dropping cooked foods, water, and other necessary items from airplanes or to packing supplies in with pack horses.

As it is essential to effectively correlate the work of the various functional crews within a unit, radios have a definite place in the organization, particularly in rough country, in heavy fuels, or with large crews. Scouts and the main overhead should have radios for their use if they are available. Ultrahigh frequency equipment can be used for control line communication and usually for communication from the line to a fire camp or headquarters.

Essential and advantageous features of functional crew organization methods are:

- 1. The entire assembly of control line construction men or machines, or both, moves forward without changing their relative positions in line.
 - 2. Facilitates equipment of crews.
- 3. Emotional stimulus is developed from the almost continuous forward movement and the feeling of large accomplishment by and identity with the crew.
- 4. Enough men can be assembled in one file to complete the control line as rapidly as the lead man can forge ahead and indicate where the control line is to be located and what work is to be done on it.
 - 5. Adequate water-boy service must be provided.
 - 6. Frequent short rest periods must be taken.
- 7. Men must be properly spaced (not less than 10 feet apart) and cautioned against the danger of being struck with a tool in the hands of another man.
 - 8. First-aid service must be provided.
- 9. Brush throwers as needed should be interspersed in the clearing crews.
- 10. Pulaskis as needed should be included with the finishing crew for barking logs, cutting roots, and completing line.

11. Older and less able-bodied men should be used in the rear crews to give them the advantage of walking in a partially completed line.

FIRE STRATEGY AND MANAGEMENT

The objective in fire fighting is to gain complete control of the fire by the quickest method with the least effort possible.

Planning Fire Suppression Needs

Small fires are usually handled by a very few men, so that calculating needs for crew action is unnecessary.

If it is evident that crew action will be necessary, the dispatcher or other responsible forest officer should calculate the suppression needs promptly for every reported fire and dispatch a crew on the basis of his calculation. A record of these calculations should invariably be made. Follow-up action should not be held up until a report has been received from the first man to reach the fire. However, the responsible man to reach the fire should calculate the needs immediately on arrival and record his calculation. If radio or other method of communication is readily available, he should furnish full information to the dispatcher on which to base a revised estimate, but if not, he should not leave the fire in order to make a report. In such cases the dispatcher will be expected to continue follow-up action according to the best information he has until more definite information is received from a responsible man on the fire.

The procedure in calculating suppression needs for manpower is divided into five steps as follows:

**		. ,
HV	ain	ble
I X	alle	me

25 chains.

- 1. Estimate the number of chains of 1. 120 chains, perimeter at end of first period.
- 2. Estimate length of held line which can be constructed per man per hour.
- 3. Divide the number of chains of held line to be constructed by the length that can be constructed in one hour by one man. This will give the number of man hours of work needed to control the fire in the first work period.
- 4. Estimate the number of hours the crew will have available to work in the first period (ordinarily not over 8 hours).
- 5. Divide the number of man-hours needed by the estimated number of hours available. This will give the number of men needed, provided they all start work at the same time.

.25

5. 480 —= 80

6

(This is the number of men needed for line construction. Add necessary SOS and overhead not on the fire line.)

Ordinarily all of the men will not arrive on the fire at the same time, and allowance must be made for this, as well as for effective time of men already working on the fire when the estimate is made. In the above example, assume that 10 men are already on the fire who can be expected to work four hours before the end of the first work period with the necessary allowance for rest, and that another crew of 30 men can arrive in time to work six hours. The crew on hand can put in 40 man-hours and the second crew 180, or a total of 220. Subtracting this number from the 480 man-hours required leaves 260 manhours to be worked by a third crew. If this crew can reach the fire in time to work four hours, it should consist of 65 men. If, however, only 40 men can be secured for this crew, there will still be 100 man-hours to be worked by a fourth crew, and if the fourth crew can arrive in time to work only two hours before the end of the first work period, it would need to consist of 50 men.

The first responsible man on the fire will usually not be able to follow the calculation through, because he cannot tell how many men can be secured, and when. He must, however, furnish the dispatcher the information under 1 and 2 above, and the number of man-hours that can be worked effectively before the end of the first work period by men he has with him.

Accurate data on rate of spread of fire are not available for all areas, and the estimate under 1 above must be based on the judgment of the best qualified man available. The following factors should be considered in making this estimate:

- 1. Kind, quantity, and arrangement of fuels.
- 2. Degree of slope, character, and aspect of topography.
- 3. Wind velocity and direction, fuel moisture, and relative humidity for the area in which the fire is located. These data can be secured from the fire danger station or stations which are comparable from the standpoints of elevation, aspect, and fuel type with the location of the fire.
- 4. The latest fire weather forecast for the area in which the fire is located.

Determination of the length of held line a man can construct per hour depends largely upon the effect of fuel, topography, and soil conditions on line construction. In addition, consideration should be given to such factors as:

- 1. Effectiveness of the organization.
- 2. Numbers of experienced and trained overhead available to direct the work.
 - 3. Character, experience, and training of the crew.
- 4. Danger of injury from falling snags and rolling logs and rocks.
 - 5. Decrease in efficiency per man as size of crew is

increased. This is due chieffy to less intensive individual supervision.

- Fatigue due to long steep hikes from camp to fire line, long shifts, inadequate rest periods, insufficient food and water, working with dull or otherwise unsatisfactory tools, and hot weather.
- 7. Method of control to be used: Direct, Parallel or Indirect.
- 8. Amount of control line which can be constructed by machinery.

Following is a tabulation of average output of held control line per hour produced by hand work and by machinery:

Approximate average rate of line construction per man hour:

Fuel Type C	
Low resistance to control	2.0
Moderate resistance to control	1.0
High resistance to control	0.50
Extreme resistance to control	0.25

Approximate average rate of line construction per hour with small size tractor-plow outfit in open type timber, requiring little or no clearing:

			Chains		
	Topography	F	ew Rocks	: Very Rough	
	Slopes below	20%	80	50	
	Slopes above	20%	60	25	

In heavy reproduction of pole size, requiring clearing by hand or bulldozer, the tractor-plow outfit should be considered as replacing only the digging crew when calculating manpower needs. If a bulldozer is available for clearing, it can be considered as replacing the clearing crew and if the two machines are worked in tandem they would replace both the clearing and digging crew. Sometimes a bulldozer is used for both clearing and fire line construction, in which case the rate of control line construction will be less than when two machines are used.

Travel to Fire

In order to avoid delay and confusion of follow-up crews and overhead, the best route or routes to the fire should be posted as soon as possible. Posting should be started at some town, ranger station, or other well-known point and should clearly mark the travel route at any questionable points on roads, trails, and cross-country to the fire. Special posters are available for this purpose. The name of the fire and camp should be written on the poster, as there may be another fire similarly posted in the same general locality.

Wherever necessary to hike a fire crew cross country to a fire they should be first organized and equipped as a functional fire crew. The scout and fire line locator should spot the route of travel and the ax and Pulaski men should mark and clear the trail enough to facilitate hiking. The amount of work that should be done on the initial trip will depend on the necessity for reaching the fire in the shortest possible time, the extent to which the work retards travel and contemplated future use of the trail. When these factors are not known, doing a little work on each trip over the trail may prove to be the best procedure. Sizing Up Fire

The effectiveness of control action depends largely on the completeness and accuracy of pertinent information. At no time on a fire is scouting more important than following the first blow-up period. Based on the calculations made by the dispatcher or other responsible forest officer, overhead crews and equipment should be enroute to the fire. The fire boss upon arrival at the fire will need information on which to plan his attack and determine his needs for additional men and equipment. The person first calculating the suppression needs should collect all information possible for use by the fire boss in making his determinations. Night scouting is particularly important during the first night, and the information obtained made available to the fire boss in sufficient time so action can be taken at daybreak. Details of general scouting are included in Part III, Chapter 3 of the Fire Control Handbook. The following existing conditions should be determined as quickly as possible by ground scouts or by other means:

- 1. Location and chains of fire perimeter. (Show on map or sketch.)
- 2. Fuel types in which fire is burning and in the immediate path of fire. Snag patches, if any.
 - 3. Location and size of hot spots or spot fires.
 - 4. Location and extent of natural barriers.
- 5. Topographic features affecting the spread or control of the fire.
 - 6. Anchor points from which to start the attack.
 - 7. Equipment shows—pump and tractor.
- 8. Camp locations close to the fire line—consider hauling water if necessary.

Additional factors that should be given consideration by the fire boss are:

- 1. Time of day.
- 2. Season of year.
- Weather, present and forecasted, and burning index values.
- 4. Men, equipment, and transportation facilities available.
 - 5. Future reinforcements of men and supplies.

Plan of Action

The crews should ordinarily attack immediately upon arrival at the fire. They should be deployed on the basis

of accessibility and importance of attack points. Scouting should be pressed aggressively to determine if there are more strategic points of attack, in which case it may be desirable to shift the crews. Usually the entire crew will attack from one or two points, but occasionally a small "hot spot" crew sent to some distant point on the fire can cut off a "lead" and materially reduce the size of the burn and control job.

In planning the attack, the following conditions should be considered:

- 1. Sections where the fire is about to reach areas where control will become more difficult, such as snag areas, blowdowns, or slashings.
- 2. Sections where valuable timber, improvements, or other high values may be destroyed.
 - 3. Spot fires that are spreading rapidly.
- 4. Fire breaks that may be held with a minimum of effort, such as roads, rock flats, sharp ridges, streams, snagbreaks, and meadows.
- 5 Sections that may be temporarily neglected, such as along the border of a green timber stand, sections where the fire is smoldering, areas of sparse and slow-burning fuels, the downhill or windward side of a fire, and sections close to natural barriers.
- 6. Anchor points, such as streams, roads, ridges, dead portions of the fire, etc., from where work can be logically started.

If there is a choice of crews, assign those most physically fit and best trained to the most difficult or inaccessible jobs. Crews equipped with light-weight rations and beds can be sent to locations farthest from roads and trails. Consideration should also be given to dropping dry rations or cooked foods, beds, and water by airplane.

In determining the facilities necessary to control the fire, careful thought should be given to:

- 1. Adequacy of manpower, especially relief crews. (See calculation of suppression needs in this chapter.)
- Possibility of using tractors and plows or bulldozers, power saws, pumps, tank trucks, and gravity water systems.
 - 3. Amount and proper kind of hand tools.

FIRE FIGHTING METHODS AND TECHNIQUES

There are three basic methods of constructing a control line, each of which is adapted to certain conditions of fire behavior: (1) Direct, (2) Parallel, and (3) Indirect. Specific jobs such as line location and line construction applicable to a particular method are described under the method, and those common to all three methods such as snag falling and mopup are described separately.

Direct Method

By this method, the attack is focused directly on the edge of the fire. For example, a hot grass fire can be fought successfully by the direct method, using wet sacks or swatters, or smothering with clean dirt applied with a shovel and thrown in a sweeping motion. Often the spread of fire is stopped by applying water directly on the flames. (See "Use of Water.") However, on medium and large-size fires, the direct method is usually employed only on sections of the fire line that have cooled down so that the edge of the fire can be dug out, scraped or pushed into the burned area or cold-trailed.

Use of this method permits immediate reduction in the volume of heat thrown out by the fire, eliminates the needs and problems of burning out and line location, reduces the actual amount of line worked through utilizing the edges which have gone out by themselves, and keeps the burned area down to the smallest size possible. On the other hand, this method results in a much longer control line to patrol and mopup, as the fingers of the fire are followed closely.

The method has only limited use in fighting medium or large-size forest fires because of the heavier fuels and the large areas where water is not available or use of pumpers is not practical.

Cold-Trailing

Although cold-trailing is a part of the direct method, its importance justifies special emphasis since maximum use should be made of it wherever the fire edge appears dead. It consists of a very careful inspection of the apparently dead fire edge, digging out any live spots or trenching short pieces of live edge, and feeling with the hands where there is the slightest doubt as to whether any fire remains. Cold fire edge should be regarded as control line, and clearing and fire line construction, other than mentioned above, need not be done.

Badly Spotted and Fingered Fire Edge

Fire has made its run in fast-burning fuel, such as slashing or a Douglas-fir old burn, and then burned into green timber or the weather conditions became more favorable. The resulting fire edge is badly fingered; most of it has gone out but numerous spot fires are smouldering as far as a half mile or more ahead. There are many unburned islands inside the main burn and a number of places along the burned edge are still smoking. Weather conditions and the type of fuel make it impracticable to build a continuous line and burn out. The area is rough and contains a heavy stand of reproduction.

Control action should consist of gridiron crews coldtrailing and half-mooning hot spots. In order to facilitate travel through the area and for use later in mopup work, a foot trail and a system of marking are desirable. The foot trail should be located about center through the spotted section in a definite direction. It should be brushed out just enough for rough traveling. Tags showing the number of spots may be placed along this trail at the takeoff to each hot spot or series of spots. In some instances it may be desirable to indicate on the tags the distance and direction of the spots. Lines should be blazed or marked from the foot trail to the spots. On the larger projects mile markers may be established along the foot trail to better identify sections of the area.

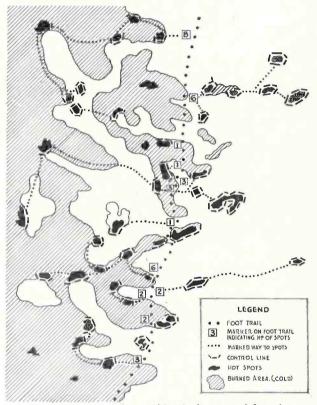


Fig. 16—A system for marking badly spotted fire edge.

Parallel Method

This method, as the name implies, contemplates construction of a control line near or parallel to the fire edge and burning out the intervening strip. It is the fire fighting method most commonly used to fight medium and large-size fires.

The average forest fire is too hot, and there is too much smoke to permit stopping the spread by use of the direct method. The usual procedure for fighting such fires is to start a control line at some anchor point, such as a rockslide, road, trail, stream, or clearing, and generally follow the fire edge. The distance between the control line and the fire edge will vary according to such factors as heat, smoke, location of natural barriers and dangerous fuels.

There should be a balance between the amount of work to construct the line and to safely burn out the intervening strip. In general, the control line will be constructed as close to the fire edge as the men can comfortably work. There are exceptions to this rule, especially if the fire edge is irregular or dangerous fuels are present. Exceptions are discussed under "Fire Line Location."

Fire Line Location

In general, the following will govern:

1. Wherever a choice permits, locate the line to give an uphill start to burning-out fire.



Fig. 17—Fire line located to give uphill start to burning out fire.

2. Within reason, select shortest line locations and easiest routes to expedite control job by cutting across the base of badly fingered fires and taking advantage of openings or thin ground cover and natural barriers.



Fig. 18—Fire line located to follow shortest and easiest route.

- 3. Avoid sharp angles.
- 4. Locate the line far enough from burning snags to catch sparks and to enclose snags when felled.

5. Block off hazardous fuels or snags by leaving outside of line.



Fig. 19—Fire line located to eliminate hazardous fuels.

6. Lead the fire far enough to allow time to construct and burn out the control line. This will vary according to time of day, topography and fuels.



Fig. 20—Fire line located far enough ahead of main fire to allow time to construct and burn out line.

7. Locate the line to minimize roll. Locate straight up and down a slope whenever possible.

Clearing

Clearing should be wide enough to facilitate working. Where there is possibility of the heat from the backfire or main fire igniting fuel outside the line, the clearing should be wide enough to reduce this danger, but excessive clearing widths should be avoided. Green brush that will not burn readily should be left if it does not interfere with the workers. The clearing debris should be scattered outside of the line in such a manner that it will not form a fire trap or hinder getting at spot fires.

In some cases it may be desirable to pile the debris, particularly light, dry material, inside the fire line to aid burning out or to help give the burning-out fire a start. Logs across the line should be made safe by extinguishing any fire in them, removing the bark, and safeguarding

against fire crossing the line. Very few logs should be cut in initial action, except small dry logs common in many places in the pine region.

Tractors with a bulldozer are often used to clear the control line. They are particularly valuable if the clearing is heavy as in lodgepole or thick reproduction.

Trees that crown close to the line are likely to throw fire across the line. To avoid such crowning, dangerous trees should either be cut or the lower branches trimmed and all hazardous fuel removed from beneath them. In some cases it may be necessary to burn out the moss in trees close to the line as a part of clearing work if conditions are favorable.

Constructing the Fire Line

When a fire line is necessary, it should be only of sufficient width to hold the burning-out fire and prevent flames, heat, or creeping fire from igniting material outside of the line. Length should be the objective, and unnecessary work should not be condoned anywhere on the line. The fire line should be dug to mineral soil, and special care should be given to removing dead roots and pockets of rotten wood. Ordinarily in digging the fire line the debris should be graded or shoveled to the outside. However, in some instances the light dry materials may be thrown to the inside if they will be of assistance in starting or spreading the burning-out fire, and if they will not form a menace by smoldering a long time or throwing sparks.

On a steep slope above a fire it is often necessary to throw the debris inside the fire, and it should usually be scattered well inside the line. When the fire line is on a steep slope below a fire, the material should be graded out and the outer edge of the line raised so as to form a cupped trench to catch rolling embers. If the fire line runs straight downhill and there is serious danger from rolling embers, the fire line should be deeply cupped and banked on the outer edge with frequent earth dams across its course, placed at an angle so as to direct the rolling material inside the burned area. Care should be taken to avoid overrefinement of the fire line. There is no standard width for a fire line, but it should be wide enough to hold the burning-out fire.

On grass fires often the burning-out fire may be started without the presence of any fire line. As this fire spreads, it is beaten out on the outside edge and this cold edge then serves as a fire line.

Hand tools used in fire line construction vary with the fuel types. Hoe, Pulaski, Kortich, and shovel are the most commonly used. Swatter, road rake, wire broom, and Kortich are valuable on grass or light duff fires.

Tractor units are used extensively on fires where the topography and fuel type permit. A wheelless plow drawn

by a small size crawler-type tractor is perhaps the most common unit. Such units can be quickly transported on $1\frac{1}{2}$ to 4-ton trucks, depending on the size of the tractor. The type and condition of the soil and the cover type are factors that govern where these units can be worked. Tractors with plows can construct fire line up slopes of 36% to 45% and can climb slopes up to 50% with the plow raised. These units can work safely along a contour on 45% slopes and can build fire line downhill on 65% slopes. They can operate in quite heavy brush and stands of reproduction. The rate of construction averages from one-half to one mile per hour.

In heavy fuels, such as in the Douglas-fir type or in lodgepole deadenings, the larger tractors with bulldozers are particularly effective. Very little advanced clearing is necessary except bucking large logs. It is sometimes advantageous to work two heavy units in tandem so the forward movement is continuous. The first tractor pushes over standing material and the second pushes the debris aside and builds a wide fire line to mineral soil. If a tractor without a bulldozer or plow is available, fire line can sometimes be constructed by pulling a large log or rock. These large tractors are usually obtainable from road jobs and logging operations, but they are difficult to transport unless a heavy semi-trailer or trailer and heavy truck are aavilable.

In the use of machinery for clearing or constructing a fire line, the following should be observed:

- 1. Use experienced operators in short shifts.
- 2. Equipment should be properly serviced according to schedule. Use horses if necessary to pack gas, oil, and water.
- 3. If possible, secure equipment in good condition and equipped for night work, or have extra lights available.
- 4. Provide competent line locators and adequate clearing crews.
- 5. Where reproduction or other cover is dense, two or more line locators should be provided. One locator should remain within sight of the tractor operator and the other locator or locators should be ahead looking for the best way through and calling back to the locator nearest the tractor.
- 6. If a steep slope is encountered up which the tractor cannot be worked uphill, an easier route around should be found. Then the tractor can usually work back downhill and construct the fire line over the desired location.
- 7. Often by notching large logs or sawing a single cut, they can be broken and pushed or pulled apart by the tractor.

Tractors can also be used to haul camp supplies, tanks of water, and other equipment on carts or "stone boats"

where it is impossible to go with trucks or cars. Tractors may also be used extensively to pull logs and chunks away from the fire line, and do other jobs in controlling and mopping up the fire.

Burning Out

Fires fought by the parallel method leave an unburned strip between the fire line and the fire edge. This unburned strip must be burned out before the control line is considered completed. The process of setting fires to burn out the intervening strip is called "burning out." The usual practice is to burn out coincident with construction of the fire line. Sometimes this is not feasible because smoke from the burning-out fires tends to smother the clearing and digging crews. When this condition prevails, burning out should be delayed until the construction crews are far enough ahead or the direction of the control line changes so they can work unhampered by smoke. Burning out is usually done by fusees, flamethrowers, or torches, but shovelfuls of live coals or an ignited pitch stick can be used if necessary. In slow-burning fuels, the large amount of heat generated by the use of flamethrowers or torches is essential to a thorough job.

The procedure to follow in setting the burning-out fire will depend somewhat on the condition of the main fire, the direction of the wind or draft, and location of material that will ignite readily. Hot burning fuels, such as stumps, logs, slash and dry debris, should be fired first. Under normal conditions, the burning-out fire is set about 2 or 3 feet from the edge of the control line. The man or men burning out walk in the fire line holding the torch or fusee at a natural angle toward the ground. The burning-out fire spreads both ways but usually faster toward the main fire because of the draft or "pull." If the main fire is hot and the intervening strip between it and the fire line is 50 or 100 feet wide, two strings of burning-out fires may be desirable. The first fires are set 15 or 20 feet in from the control line and a second string of fires, paralleling the first, is set 2 or 3 feet in from the edge of the control line. By this latter process, the width of the fire line can be widened more rapidly and the volume of heat from the main fire reduced before it reaches the control line. When the moisture content of the fuel is increased by a sudden rise in humidity, it may be necessary to force burning of the intervening strip by adding dry fuel to the fires. If burning out becomes too difficult because of green vegetation or damp fuel, it may be more efficient to construct a new line following the fire's edge instead of expending a lot of effort coaxing the burning-out fires.

Occasionally in light fuels, such as cheatgrass, the burning-out fire is set without constructing a fire line. In such cases, control of the burning-out fire is accomplished

by smothering with dirt, use of a beater or water, or pushing the burning edge into the area burnt over with a rake or a Kortich tool.

Holding

After the burning-out fire has been set, there is usually considerable work to be done to make the fire safe and to prevent fire from crossing the line. This work is termed "holding," and consists of the following:

- 1. Cooling down hot spots near edge of fire line.
- 2. Putting out spot fires outside the line.
- 3. Preventing hot points from developing by reconstructing short pieces of line to place unburned concentrations of fuels on the outside of the fire line.
- 4. Cooling down hot spots inside the fire line by throwing dirt, separating fuels, and pulling or pushing chunks away from the line.
- 5. Falling or putting out fire in snags that are aftre adjacent to the fire line, either inside or outside.
- 6. Constructing portions of new fire line to pick up "slopovers" where the fire has jumped the line.
- 7. Aiding the burning-out fires where and when necessary.

Water and water equipment have proved valuable in holding fire next to small streams, roads, trails, and other natural breaks used as control lines, particularly if hotburning fuels are present. Water is useful to cool areas around snags so that fallers can reach them, to cool hot spots under trees so as to prevent them from crowning, to check fast-running fires, and to wet areas outside established lines where danger of fires starting across the line is present. The use of "hand pumps" and back-pack cans or bags is valuable for helping to cool down hot points and putting out small spots outside of established fire lines before they start spreading.

Indirect Method

The indirect method of fire fighting consists of selecting a location and preparing a fire control line at a considerable distance from and usually across the path of the main fire and backfiring out the wide intervening area. Such a method is employed to stop the spread of a crown fire, reduce the control job by backing up to a prepared firebreak, stream, road, natural firebreak, or to reduce or eliminate an arduous climb or long hiking distance in rugged topography.

Fire Line Location

Since the indirect method requires use of a backfire, much will depend upon correct location of the control line. The objectives to keep in mind in locating a line for backfiring are:

1. Choose a location which can be most easily held. Usually it will be either a canyon bottom or a ridgetop.

2. When backfiring from a ridgetop, locate the line on the side opposite from the main fire to provide an uphill start to the backfire. On a sharp ridge, the distance of the line down from the top need not be far.

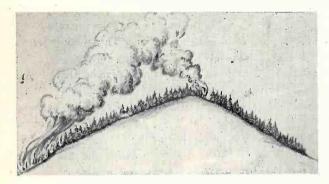


Fig. 21—Fire line constructed to give uphill start to backfire.

The flatter the ridge, the greater should be the distance away from the main fire in order to have the control line outside the range of falling sparks, other conditions being the same.



Fig. 22—Fire line constructed outside range of falling sparks.

- 3. Subject to (1), find the location which will require the least work. Select natural barriers, such as rock slides, open ridges, streams, roads.
- 4. Select a location that is fairly straight; sharp bends should be avoided as they are difficult to hold.
- 5. Locate the line far enough in advance of the main fire to provide time for completing the construction of the control line and to prepare for backfiring. This is particularly important when considering the bottom of a canyon.
- 6. In the case of a firebreak on which snags have been felled, locate the line near the side of the strip farthest from the fire.
- 7. Whenever a choice permits, locate control line to eliminate destruction of high values.

Clearing

Clearing will be similar to that described for the parallel method. If a stream is used for a fire line, special consideration should be given to felling overhanging dead or mossy trees, adjacent dead snags, and bucking out dry logs that span the stream. Log jams should be cleared or at least recognized as danger points requiring special attention when setting the backfire.

Constructing the Fire Line

The same principle of line construction, clearing and digging, will apply as described under the parallel method of fighting fire.

Back firing

Preparation and timing are very important for successful backfiring. The backfiring equipment, torches, flamethrowers, fusees, or a good supply of pitchy sticks should be ready. Crews should be available for both setting and holding the backfires. The backfire crew should be experienced in selecting the material and location for setting the backfires so they will "take off" and spread rapidly.

Theoretically, the ideal time to backfire is when wind or drafts are favorable and material can be easily ignited and burns readily without creating too dangerous a volume of heat. On account of periodic fluctuations in dampness of material, these conditions, except as to wind and drafts, generally occur twice a day, in the middle of the morning and in late afternoon or evening. Evening is ordinarily considered a safer time to backfire because sparks falling outside the control line are easily detected, relative humidity is usually higher making control of the backfire easier, and the backfire has all night to burn down before the bad burning period of next day. On the other hand, by starting backfires early in the morning, strips adjacent to the line are burned out while there is the least danger from sparks. By the time fires become intensely hot, there is a considerable gap between the line and the backfire. Frequently fires cannot be made to spread between midnight and 7:00 a.m. or 8:00 a.m.

When conditions are favorable, the usual procedure is to set a single string of backfires at the edge of the fire line. The draft created by the main fire will "pull" the backfire toward the main fire. If litter is hard to ignite, build bonfires in any favorable spot but eventually spread embers so as to secure a clean burn from edge of the control line. Under favorable conditions, backfiring becomes a comparatively simple and expedient process for controlling a fire.

More often backfiring must be done when moisture content and the volume of fuels are critical and velocity and direction of wind unfavorable. Under adverse conditions, backfiring becomes a very skillful art that involves a calculated risk which at time, must be taken.

It is possible to exercise some control over adverse conditions by skillful timing and location of the backfires to

create favorable back drafts and to reduce the volume of heat. One of the most common procedures for influencing drafts and reducing heat is by backfiring in strips.



Fig. 23—Backfiring in strips; (a) 1st strip backfires, (b) 2nd strip backfires set at edge of fire line, (c) 3rd strip backfires, (d) 4th strip backfires, (e) main fire.

The number of strips required will depend on the adverseness of conditions. Usually one or two strips are all that time will permit setting before the main fire makes further effort unsafe or unnecessary. If the control line is near the top and on the opposite side of the ridge from the main fire, the first string of fires should be set 50 to 200 feet from the fire line and on the side of the ridge nearest the fire; the second set of fires should be set at the edge of the fire line. The purpose in this case is to burn off the top of the ridge. If time permits or a further reduction in heat is desirable, a third and fourth set of fires should be set between the main fire and the first fire, but not until after the hottest period of the first and second fires has passed.

Drafts are worst when flames from the backfires meet or when the flames from the backfire meet the main fire, especially so if they are crowning. Every precaution should be taken to reduce the danger from brands by keeping down the volume of heat.

Where the selected control line crosses the head of a canyon or a low "saddle" on a high divide, such danger spots or "chimneys" should be carefully studied before the line is backfired, as the winds and drafts are often more intense at these points because of topographic influences. Usually it will be necessary to drop the control line farther down on the side away from the main fire when crossing a saddle. It will be necessary to keep clown the volume of heat at this point to reduce the danger from brands carried by the wind and draft. This can be accomplished by backfiring in narrow strips from the top down

starting first on the side away from the main fire. When the heat from this side has subsided, the process should be repeated on the side adjacent to the main fire.

Sometimes advantage can be taken of down drafts, such as usually occur at night and early morning, to make a saddle safe from a blow-up during the critical period of the following day. This can be done by strip burning, beginning as near to the main fire as the men can safely work and working up the slope. Backfiring from temporary fire lines will afford better opportunity to control the backfire when the mechanical effect of the slope tends to offset the "pull" from the main fire. If the saddle can be made safe in this manner, it will not be necessary to drop the main control line down on the far side as suggested above.



Fig. 24—Backfiring the head of a canyon or low saddle.

Speed in setting backfires is sometimes essential, and may require backfiring at several places along the line simultaneously. Backfiring from the ends toward the middle is sometimes desirable to keep the fires from flanking the ends.

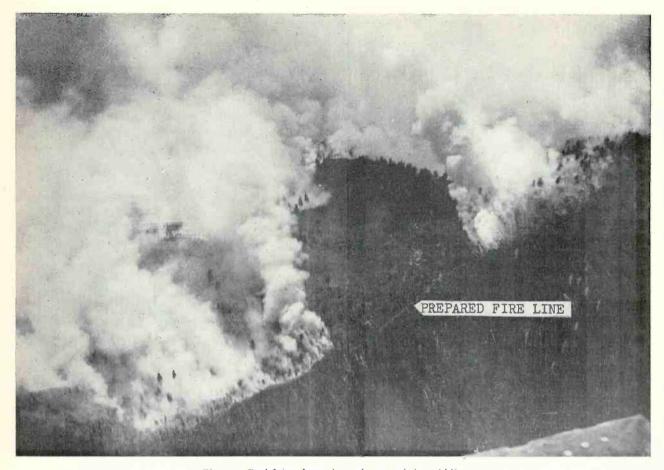


Fig. 25-Backfiring from the ends toward the middle.

Usually control of the backfire can be accomplished with fewer men if firing progresses from one direction.

When a fire line runs up the side of a steep slope, always begin backfiring at the top and work down or the uphill draft may cause the backfire to sweep up along the line too fiercely to hold. Burn off a small wedge at the top, then work down along line. In doing this, it will often be found most helpful to set strings of fire at frequent intervals along the contour of the hill, extending in from the fire line a hundred yards or more, thus creating a large heated area which should result in a favorable draft. Once the backfiring has started, it should be carried through to completion.



Fig. 26—Backfiring from top down by burning out wedges or compartments one at a time. Number indicates priority for burning.

Holding

The principles described in the parallel method for holding burning-out fires applies to "holding backfires." In addition, more attention must be given to spot fires.

In the case of backfiring out a canyon or draw, if winds or drafts are erratic, spot-fire hunters should be located far enough on the side of the slope opposite the fire to permit downhill travel to put out burning brands. High bluffs adjacent to but on the opposite side of the stream or canyon bottom from the backfire are danger points and become critical when they occur in a sharp bend. High bluffs or cliffs adjacent to and on the same side as the backfire causes the air currents to rise vertically, thereby increasing the chances for spot fires across the canyon. Spot fire crews should be located at critical danger points in advance of backfiring.

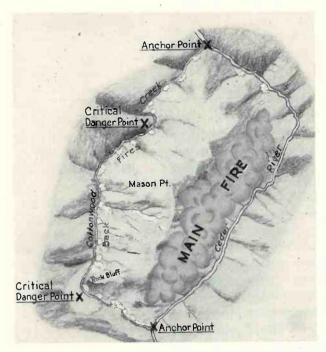


Fig. 27—Critical danger points when backfiring from bottom of a steep canyon.

Log jams and leaning moss-covered trees across streams used for holding the backfire, should be watched during the early stages of backfiring or eliminated before the backfire is started. Sparks are more easily detected when backfiring is done at night. The size of the holding crew needed will be governed by such factors as adverse drafts or winds, the size or nature of the backfiring job, and topography. If conditions are favorable so that there is a good strong "pull" toward the main fire, fewer men will be needed than if conditions are unfavorable. Ordinarily

too few men are on hand to insure control of the backfire, especially when adverse conditions prevail.

Snagfalling

In heavy snag areas, especially in the Douglas-fir region, a special problem is encountered.

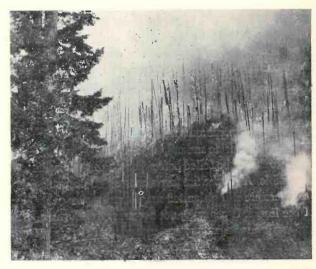


Fig. 28—Heavy Douglas-fir snag area.

A well brushed-out and dug fire line is of no value if snags on both sides of the line carry the fire across overhead. Often it is possible to locate the control line at the edge of the snag area or at a sufficient distance outside so that sparks from burning snags will fall inside the control lines. However, if the snag area is extensive and there are no prepared or natural breaks to fall back to, it may be necessary to construct the control line through the snags.

In locating the control line through a snag area, advantage should be taken of stream bottoms, ridges or other rises, areas where the snags are smaller and fewer in number, and locations where the felled snags will cause the least trouble from hot ground fires. Of course, it is desirable to immediately fall every snag that is scattering or might scatter fire across the lines. When there are only a few and they are not too hot or dangerous, this should be done. When this is not possible, the most troublesome ones should be worked on first. But, before any fire is safe, every burning snag should be felled that might scatter fire or burn off and slide or roll across the line.

In determining which snags to fall first or which ones are most likely to give trouble, the following points should be considered:

- High snags, including those on ridgetops, scatter sparks farther than low ones.
- Shaggy, partly rotten snags burn longer and scatter sparks much worse than sound ones.

- 3. Snags in old burns or other openings scatter fire worse than those in green timber because they are more exposed to wind. Both the snags and the material in which sparks light are drier, and there is less green foliage to act as a retardant or catch the sparks before they light on inflammable material.
- 4. Hollow-butted or pitchy snags are more likely to burn through and fall.
- 5. Snags that have burned and their outer shell is gone are less likely to scatter embers than those in the early burning stages when rising heat drafts carry sparks high in the air.

Burning snags should be felled inside the line or have a landing bed prepared for them.

Snags both inside and outside the fire line that are likely to ignite should be felled before burning out or backfiring, if possible. After the fire has consumed all burnable fuels and there are still unignited snags standing on either side of the line, it is generally not necessary to fell them.

Snagfalling is dangerous work and requires experienced men, especially where the snags are large and close together. In falling snags a third man must be used as a lookout to watch for falling bark, limbs, or tops. If available, fallers shall wear hard hats to lessen the danger from head injuries.

Use of Water (See Chapter III-2)

In some instances where fuels are exceptionally heavy, and water, hose and pumping equipment are readily available, it is desirable to control the fire with water. The same general plan of attack and practically the same methods are employed as in controlling a fire without water except for the following:

- 1. Instead of actually building a fire line and burning it out or backfiring, the outside edge of the fire is extinguished and sluided out with water on a narrow strip, usually 2 to 3 feet wide. Or the burning out or backfire may be set, allowed to get a good start, and then the outer edge watered out.
- 2. Water may be used in place of drit for checking runs, putting out spot fires, quieting down hot spots near the fire line, extinguishing fixes in snags or under mossy trees, and in final mopup.

On areas where roadside fires are a problem and in more open country, such as eastern Washington and Oregon, motorized water equipment is valuable for initial action and mopup of fires. Trucks or pickups equipped with tanks, pump, and hose can handle easily accessible small fires with less danger and effort involved than by any other method. For slash areas and units containing a good many roads, the use of fast water outfits for initial action is considered good practice if special trained operators and

crews are available. Water can sometimes be used effectively to check a running fire until a control line can be established with machinery or hand tools.

It asually is not possible to include the extensive use of water during control, and the decision to use it should be made only after an analysis of the conditions show distinct advantages. It must be remembered that nearly everything that can be done with water can also be done, but a little less effectively, with dirt, which is nearly always available.

The extensive use of water is contingent upon the practicability of installing a pump or gravity system, transportation of equipment, time and labor involved in distributing it on the ground, and effectiveness of water compared with other means of control.

When a control line has been completed around the fire and much of the dust and surface fuels consumed inside the line, leaving a large percentage of the inside area clean burned, water may be used to good advantage in mopping up the remaining fire.

Except, as noted above, it is better to keep fuels wet on the outside of the control line and permit materials inside the line to burn down before starting the use of water there. The tendency of nozzlemen to waste water has to be combatted at all times. If water is being used to cool down or put out flaming material, it is most effective when applied to the fuel and not to the flame area above the fuel. An inexperienced nozzleman can easily waste 80% of the water delivered. One or more men with shovels and Pulaskis should work with the nozzlemen to dig out and open up persistent pockets, break rotten logs apart, and turn deep duff. Where stumps, snag, logs, and other heavy fuels are burning, nozzlemen should not attempt to put them out with one soaking. Returning and soaking them at intervals is the surest and quickest way to completely extinguish the fire in them. Snags must be drenched from all sides, starting at the highest fire and working down. Logs should be rolled out of their hot beds if possible before water is applied, or immediately after they have been cooled down. To speed up work, one or two take-offs with either 11/2-inch or smaller hose, as available, should be made. Also, use back-pack pumps for extinguishing small isolated spots when this is easier and quicker than shifting hose.

Several methods of putting water on a fire follow:

Gravity System

A gravity system is feasible whenever an adequate supply of water is available at an elevation 40 feet or more above the point where the water is to be used. Since this is the most economical method of bringing water to a fire it should be used wherever possible. Besides the economic that the advantages of being easy to install and supplying

a constant flow of water. The following points should be kept in mind when installing a gravity system:

Use a gravity intake sock or metal funnel at the intake. If these are not available, the hose itself can be used of a short section of $1\frac{1}{2}$ -inch pipe will do.

2. Place the mouth of the intake well below the water line so air will not be sucked into the hose.

3. Have a fairly steep drop in the first 25 to 100 feet of hose.

4. Connect only one section of hose at a time if pressure is weak and permit the water to run for an instant before connecting the next section. The resistance of a long length of flat hose is sometimes great enough to prevent delivery of water when attempting to operate with low pressures.

5. Lay the hose in as straight a line as possible. Sharp bends should not be made over logs, poles or rocks. The line may be laid into a depression or canyon and out again provided that in no place is any part of the line higher than the intake.

6. Where there is considerable fall, install a valve near the lower end of the line and adjust valve to relieve excessive pressures, or use a larger nozzle. If a valve or larger nozzles are not available relieve pressure by loosening connections.

7. The hose will appear that even when carrying water, except near the nozzle end. This is its normal appearance in a gravity system.

Power Pumpers

Some portable pumpers are powered with 2-cycle engines, others with 4-cycle engines. The difference is important from the standpoint of operations. The 4-cycle engines used run at relatively slow speeds and are lubricated in the same manner as automobile engines, i.e., from oil in the crankcase. Two-cycle engines which are used for greater compactness and minimum weight in proportion to horsepower, run at high speeds and are lubricated by mixing oil with the gasoline. It is essential that the oil be accurately measured and the proper mixture used; otherwise, trouble is sure to result.

Instructions for operation of each pumper are given on a plate attached to the unit. Additional instructions are:

Set pumper level while operating.

2. Never operate pumper with suction hose disconnected or out of the water.

3. Before starting the engine, squirt lubricating oil liberally over the pump rotors through the discharge outlet; be sure intake gasket is in place and the suction hose connection is tight. This will insure immediate draft of water.

4. The suction-hose strainer should be tightly con-

mud or gravel bottom, as small pebbles and dirt will be drawn into the pump. The intake can be held in free water by tying it to a stake. The strainer should be cleaned occasionally.

5. Keep the pump clean and all bolts and nuts tight.

6. Avoid racing the engine under a light load. This applies particularly to 2-cycle engines. Most 4-cycle engines used on pumpers are equipped with a governor.

7. If a two-way valve is used at the pump, insert a short section of hose between the pump and the valve to reduce vibration. Even with one hose line, a two-way valve is often desirable to facilitate starting against load.

8. A combination check and relief valve should be used, especially with light, high-speed pumpers; otherwise, a kink in the discharge hose may throw a very heavy load on the pumper momentarily and cause damage to the shaft or other parts. The relief valve should be set at a reasonable pressure, ordinarily 150 pounds.

9. A 2-cycle engine should be stopped by shutting off the gasoline supply so that lubricating oil will not settle in the carburetor and make starting difficult. Shake gas tank just before starting.

10. If engine is water-cooled, see that water flows freely from all tubes leading from cylinder jackets. Test water temperature with the hand and regulate flow so that water is nearly as hot as can be borne.

The following points should be kept in mind when installing and using a pumping system:

1. Do not lay hose over sharp rocks or limbs. This is especially important near the pump as the constant vibration may soon wear a hole in the hose.

2. Lay hose in as straight a line as possible. Avoid sharp curves or kinks.

3. Lay extra hose ahead with an extra nozzle so that locations can be changed without delay. If available, a two-way valve should be installed near the end of the hose line so extra hose may be added without disconnecting the main line.

4. Do not sprinkle. Work close to the fire and use the full force of the water. This is very important in the case of heavy duff on the fire edge, which must be torn to pieces by forcing the water underneath. Sprinkling on top is ineffective.

5. Move nozzle up and down or sideways to give the water a tearing force.

6. Apply water from the outer edge toward the center of the fire so burning material will not be thrown across the fire line. If possible, hose work should start on the upper slope of the fire so waste water will run down the hill into other burning material.

Cool off area at base of snags, then work from top down, to take advantage of waste water.

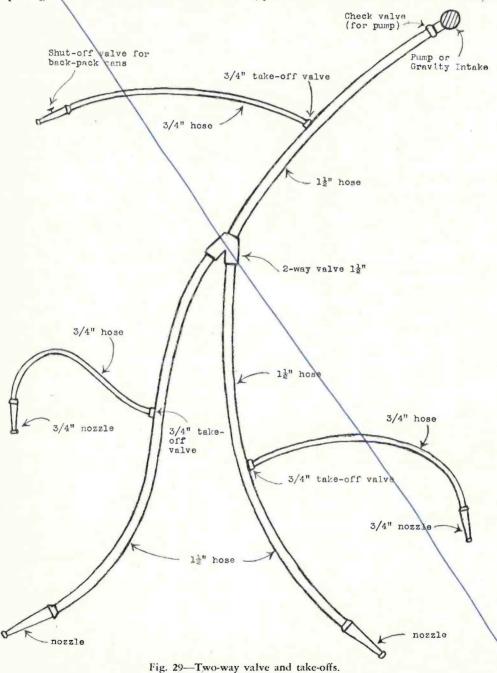
8. Force water under logs if they cannot be rolled over, and at the base of a hot spot, not into the flame. The nozzleman must work close to the fire and he will get wet if he does his job right.

9. Sufficient men should be used to pack a hose line through the brush and distribute the hose in a hurry. After the water is flowing one man should be at each nozzle, one to three pulling the hose for him and two to four

laying out additional hose for extensions and new locations. The nozzleman should be changed occasionally, as it is a difficult job if properly done. A foreman will be in charge of one unit, and if several units are in use, a sector boss will supervise the entire system.

10. Leaky or burst sections of hose should be tied in a knot and returned to camp.

11. To conserve water and make it available for several places at one time, two-way valves and take-off valves with \(\frac{3}{4} \) or 1-inch hose should be used wherever possible.



Tank Trucks

These units are now in general use. They consist of fast trucks with slip-on or detachable tanks for hauling water and a pumper using $\frac{3}{4}$ or $\frac{1}{2}$ -inch hose for putting the water on the fire. A by-pass valve at the pump insures maximum conservation of water. Tank trucks are also useful for hauling water to a dry fire camp or for sprinkling dusty roads next to camps. Often small slip-on tanks can be hauled on a "stone boat" with a tractor into areas being treated with back-pack cans.

Horse-Pack Cans

Special cans and 5- or 10-gallon milk cans are used to transport water to fires by pack stock. The water is then distributed and used on the fire from back-pack cans and hand pumps. Often a tank truck can be used to go part way and the water transferred to horse-pack cans for delivery on the fire line.

Water Relay

This equipment is particularly adapted to mopup work where the burning spots are widely separated. Usually the cans are filled at a natural water supply, but water may be relayed to them by gravity or power-pump systems, tank trucks, tractor-hauled tanks or barrels, or horse-pack cans

Back-Pack Cans and Pumps

Sometimes it is desirable to pump water to an elevation beyond the lifting capacity of a five pump. The usual method is to pump the water up the hill in relays by the use of two or more pumpers, hose, and one or more sumps. The first sump is located as far up the hill as the pumper can force the water. A second pumper is located at this point and pumps the water from the first sump to a second sump located farther up the slope. The relays are repeated until the desired elevation is reached. Except in heavy clay soil it will be necessary to line the sump with capitals are prevent loss of water through the soil.

Reburns

In certain cases a fire may burn over an area, killing the brush without consuming the foliage, or it may scorch and brown the needles of reproduction or mature timber. In such areas, where the fire has skipped islands of litter, there is considerable danger that they may flare up after several days and carry flames into the dried foliage or needles and cause a flashy reburn. If such an occurrence appears likely, an exceptionally wide strip should be

slashed along the control line or the foliage should be either burned with a torch or backfired with a favorable wind. Another precautionary measure is to construct a fire line around all unburned islands that may ignite. Mossy trees, witches-broom, scorched reproduction, piles of flashy debris, and other highly inflammable fuels should be burned under favorable conditions or protected from burning by removing burning material, quickly mopping up all threatening fire with water or by using other practical methods.

Mopup

The objective in mopup is the same as for control line work: "The quickest and easiest method of accomplishing the job." After the spread of a fire has been stopped and the control line completed, a feeling of security often occurs, causing a relaxation in vigilance and a letdown in output of efficient work. Such a letdown is likely to result in having to do the control job all over again and perhaps on a larger scale. It is also true that poor management of large mopup forces results in large expenditures that are unjustified.

Recognizing and applying the best methods of procedure in mopup require careful judgment, and the supervision of the men is more exacting than in control line construction. The most reliable, experienced overhead available should be used for supervising mopup work and men capable of independent action should, if possible, be selected for the crew.

Mopup Plan

In preparing the mopup plan, the objectives of the job should be definitely decided. In this step, consideration should be given to existing and probable weather conditions, character of the fuels, and other factors affecting the possibility of the fire escaping. The following items are examples of details for which objectives should be set up:

- 1. Specific time that various mopup jobs must be completed.
- 2. Distance inside control line that burning snags must be felled or extinguished.
 - 3. Action on spot fires.
- 4. Action on smoldering duff, burning stumps, roots and logs, and distance from outside of control line.

The station or sector method (See Figure 30), in contrast to the functional method of control line construction, is an excellent form of organization for men on the mopup job.

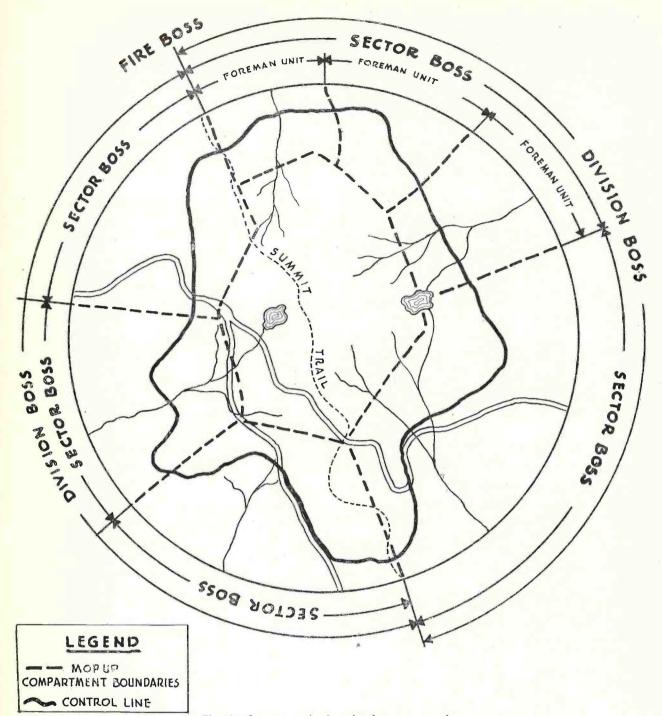


Fig. 30—Sector organization plan for mopup work.

Each man has a certain sector of line from which he works inward toward the center of the fire. As the crew is cut down, each man's sector is increased in length. This system places responsibility and gives the foreman a better opportunity to give supervision and instruction. Usually small, roving crews under dependable leaders are most effective for the final cleanup on large fires.

Overhead meetings should be held at which the objectives of the mopup plan and specific jobs such as the following should be explained and discussed:

- 1. The boundaries of the various organization units should be plainly marked on the ground.
- 2. Burning snags within spotting distance of the outside of the control line should be felled unless the fire

is near the base and can be extinguished by the use of water or earth or by chopping out the burning portions.

- 3. Burning logs and chunks should be separated to facilitate extinguishing. Often if logs and chunks are turned out of their hot beds, with the burning side up, they will go out. On steep slopes they should be turned so that they lie parallel to the direction of slope to eliminate the danger of rolling. Where only the surface of a log is smoldering, most of the fire can be scraped off or chopped out. Where the end of a large log is afire, it should be extinguished by scraping off the fire and rubbing with clean dirt, or the end of the log may have to be bucked off. Sometimes it is best to completely burn up small pieces of material. This can best be accomplished by piling the material together to hasten burning when the volume of heat created is not dangerous.
- 4. Mopup on stumps is similar to that of logs. If the fire is confined to that part above the ground, the burning parts may be cut out, or if entirely on the surface, extinguished with water or dirt. Where a stump has completely burned, leaving a smoking crater and root holes, it is advisable to dig out all the fire, or if this is impractical, either to drench with water or fill up the root hole with mineral soil and tamp firmly. When the latter is done, frequent checks should be made to make sure the fire is out.
- 5. Burning duff close to the line should be shoveled inward and scattered, if possible, on burned-over ground. Spading up and stirring thoroughly with water or clean dirt gives quick results in extinguishing such material.
- 6. Prompt action should be taken on all unburned spots, unless the material within the spots is noninflammable. These should be made safe by burning out or by constructing a fire line.

Safety

The danger in fighting forest fires is generally overemphasized. This is perhaps due to the wide publicity given the relatively few instances where men have been burned to death. On the majority of fires the greatest danger is involved in the use of tools and machinery. Falling snags and trees are a hazard on hard-burning fires in old burns and heavy timber, but only in the most exceptional cases is there much possibility that men will be trapped or evertaken by fire.

In fast-running fires, particularly in heavy brush, slash, and thick reproduction where there may be danger of crews being cut off, hemmed in, or overtaken by fire, it is well to be familiar with a few simple practices which may be helpful in cases of emergency:

1. Men in charge of fire crews should be aware of

probable risks and have in mind a clear-cut plan of action for use if necessary.

- 2. The man in charge must have sufficient self-control to appear cool and calm. He must keep his men together and instruct them in the proper things to do.
- 3. If it is necessary to move the crew off the head of a fire, there are two possibilities of getting to a safe place:
- a. It may be possible to cross through the fire front to the burned-over area. There are often places on the advancing front where heat and smoke are not too intense to prevent men getting through by a quick dash. Men should be instructed to take a deep breath and hold it while jumping through flames and heavy smoke. If possible, a handkerchief or shirt should be wet and held over the mouth and nose or used to put out sparks in the clothing.
- b. If it is necessary to move men away from the head of a fire over the unburned territory, it is best to travel obliquely to the fire's edge, if possible. It should be remembered that men can travel downhill faster than uphill and that a fire travels faster uphill than downhill. The route of travel should be carefully watched to make use of the most open ground and avoid dense underbrush where travel is slow and where men may become separated. The men should keep hand tools with them, especially shovels, and any water that may be available. In some cases in fairly light, flashy fuel, it may be possible to set a backfire and hold it when it is impossible to travel fast enough to keep ahead of the main fire.

The most common accidents on fires are caused by falling snags and trees, rolling rocks and logs, and limbs that burn off high in trees and fall silently. When such dangers are present, the overhead should call them to the attention of their men, and watchmen should be stationed at strategic locations. If fallers are working on a burning tree or snag, a third person should always be assigned to serve as a watchman.

The following safety rules are printed on the back of the firefighter's contract and cover the most common forms of accidents:

- 1. Watch your handholds and footing while walking, climbing, or working.
- 2. Guard against overhanging objects while riding in an open truck.
- Have at least ten feet between men while working or walking if carrying sharp-edged tools.
- 4. Snags, limbs, and trees often fall without warning. Watch for them.
- 5. Keep constant guard for rolling material on steep ground.

- 6. Avoid walking in hot ashes.
- 7. Bathe feet in cold salt water after work to avoid blistering. Keep socks clean.
- 8. Stay with foreman and avoid being lost or left
 - 9. Do not drink too much cold water at one time.
- 10. Be sure to have all minor cuts, bruises, burns, etc. treated immediately by first-aid man.
 - 11. Report all accidents promptly to your foreman.

The best all-time safety devices on a fire are a cool head, quick action, and familiarity with fire behavior.

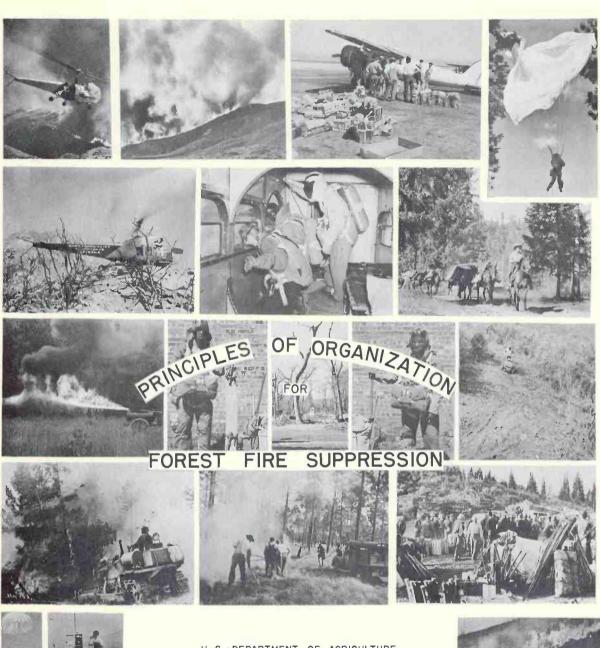
(SAN FRANCISCO-5-25-45-5.000)

SUPPLEMENT

Table of Contents

Part I - Principles of Organization for Forest Fire Suppression

R-6 F. C. Hdbk.
Page Added 8-17-53
No. 78





U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
1953









CONTENTS

			Page
	FOI	REWORD	i
Α.	SUI	PPRESSION POLICY	1
В•		GANIZATION AND MANAGEMENT OF FIRE SUPPRESSION OPERATIONS	1
C.	1000 -0000	IMARY FUNCTIONS IN THE CONTROL OF FIRES AND APPLICABLE PRINCIPLES	2-9
	a.	The Plans Function	2-5
		1. Policy	
		2. Gather and Compile all Facts	
		(a) Physical Conditions Associated with the Fire Operation	
		(b) Weather Conditions	
		(c) Records, Maps and Statistics	
		3. Analysis of Facts	
		4. Planning	
		5. Demobilization	
		6. Major Plans Decisions the Responsibility of the Fire Boss	
	b.	The Service Function	5-6
		1. Men	
		2. Camp Management	
		3. Timekeeping	
		4. Transportation and other Equipment	
		5. Communication	
		6. Procurement and Safe Distribution	
		7. First Aid and Care for the Sick and Injured	
		8. Demobilization	

	Page
c. The Line Function	6-7
d. The Command Function	7-9
1. Policy	
2. Making Assignments	
3. Unity of Command	
4. Delegation of Authority	
5. Avoid Over Staffing	
6. Execution	
(a) Selection of Personnel	
(b) Placement of Best Qualified Men	
(c) Issuing Clear-cut Instructions	
(d) Provide Behind-the-Lines Organization	
(e) Managerial Head	
7. Employee Relations	
8. Safety and Training	
PLANNING THE FIRE ORGANIZATION	9-11
a. Factors Affecting the Fire Job Load	
b. Span of Control in Organizing for Fire Suppression Operations	
SUGGESTED FIRE CONTROL ORGANIZATIONS	11-33
a. Basic Organization Guides	11-28
1. The One Man Fire - The Two Man Fire	
2. The Small Suppression Crew Fire (6 line workers)	
3. The Medium Suppression Crew Fire (14 line workers)	

D.

			Page
	4.	The Large Crew Fire (21 line workers)	
	5.	The Multiple Crew Fire (63 line workers)	
	6.	The Two Sector Fire (126 line workers)	
	7.	The Three Sector Fire (189 line workers)	
	8.	The Two Division Fire (378 line workers)	
	9.	The Multiple Division Fire (945 line workers)	
	10.	The Coordinator Stage Fire	
	b. Sp	ecialized Equipment and the Fire Organization	28-30
	c. The	Fire Headquarters and its Relations with	111111
		ine Service and Plans Units	31-32
	d. "B	chind-the-Lines Requirements	32-33
F.	ALTER	VATES	34
G.	SUMMAI	RY	34-35
H.	APPENI	DIX .	A-1-43
	1.	Job Descriptions	
		a. Fire Boss	
		b. Line Boss (Line Chief)	
		c. Division Boss	
		d. Sector Boss	
		e. Crew Boss (Foreman)	
		f. Straw Boss	
		g. Advance Line Locator	
		h. Line Scout	
		i. Cat or Plow Boss (Dozer or Plow Foreman)	
		j. Power Saw Boss (Power Saw Foreman)	
		k. Spotter	
		1. Tanker Boss (Tanker Foreman)	
		m. Service Chief	
		n. Equipment Officer (Equipment Boss)	
		o. Supply Officer (Supply Boss)	
		p. Communication Officer q. Camp Boss	
		r. Air Officer (Air Operations Boss)	
		s. Cargo Boss (Cargo Officer)	
		t. Plans Chief (Plans Boss - Operations Officer)	
		u. Information Officer (Intelligence Officer -	
		Scouting Boss) v. General Scout	
		· · · · · · · · · · · · · · · · · · ·	

w. Maps and Records Officer
x. Aerial Photo Interpreter
y. Fire Safety Officer

FOREWORD

The need for sound management practices and good organization in forest fire suppression may be compared to that of the Military in time of war since in many respects the urgency and emergency character of the operations are similar. Extensive damage and large suppression expenditures may follow if the right things are not done at the right time and in the right manner. Forest fire suppression calls for an especially smooth working organization adequate to do the job efficiently and economically. There is little time for deliberation or correcting mistakes.

Organization and management in fire operations is made doubly complex and difficult because, unlike the Military which operates with highly trained forces, a fully trained force of fire fighters is not immediately available to most fire protection agencies to fight fires that have escaped initial attack. Hundreds of fire fighters, in many cases, must be recruited in a brief period of time from private industry, cities, towns and other sources. These men, usually, are not well trained in the art of fire fighting, are frequently unacquainted with the tools used to control a fire and often do not know how the fire organization operates.

It is necessary to orient these men, organize them into an effective fire fighting force, equip them, show them how to use tools, and have them on the fire line, often within an hour or two after they arrive at the headquarters fire camp or mobilization center. No other important job is accomplished in this manner.

The problems encountered in Management and Organization of untrained fire fighters, which is normal on most large fires, have been under study by the U.S. Forest Service for many years. As certain facets of such problems were resolved or improvements made the various U.S. Forest Service regions incorporated them in handbooks covering the subject of Organization for Forest Fire Suppression.

The interchange of fire supervisory personnel, others with special skills and highly organized labor crews between U.S. Forest Service regions has become an accepted practice during this age of rapid air transportation. This brought about the need for standardization of Forest Fire Suppression Organization and Practices.

This publication is intended to meet this need. It reflects the work of many men skilled in the art of forest fire suppression, and whose job it is to apply basic management principles in organizing men and machines for control operations.

A. FIRE SUPPRESSION POLICY

The suppression policy of the Forest Service is to require fast, energetic, and thorough suppression of all fires burning (a) on Forest Service lands, (b) on other intermingled or adjacent lands when such fires constitute a threat to Forest Service lands, or (c) on lands the protection of which is a contractual obligation of the Forest Service.

When first attack forces fail to obtain this, the policy then calls for prompt calculating of the problems of the existing situation and probabilities of spread, and organizing and activating adequate strength to control every such fire within the first work period. Failing in this effort, the attack each succeeding day will be planned and executed with the aim of obtaining control before ten o'clock the next morning.

Small fires that are not potentially damaging, such as fires that start in isolated small patches of vegetation, normally at high elevations, surrounded by granite sand, water, bare rock or soil, and which can burn only a few acres, with no danger of spreading or spotting to other fuels, even should adverse weather conditions develop are exempted from the foregoing policy.

(Above policy applies to wild fires only)

B. ORGANIZATION AND MANAGEMENT OF FIRE SUPPRESSION OPERATIONS

Organization, as herein used, is defined as the executive structure of a fire operation while management is defined as a judicious use of a means to accomplish an end. Organization and management go hand in hand. It is management's function to set up a competent and adequate organization to do a job, then to adjust it to meet changes in the behavior of the fire and the fire job load.

Once a fire escapes the initial attacking force a rapid reorientation of the fire suppression job is essential. This
involves assigning a man competent to take charge of the more
involved situation. It is his primary responsibility to see
that the fire is suppressed according to the standards and
time limits required. To accomplish this he must plan an
organization based upon the principles that there must be
definite channels of Command, clear-cut definition of duties
and a positive distribution of these duties among the Command
in concise, unmistakable language.

C. PRIMARY FUNCTIONS IN THE CONTROL OF FIRES AND APPLICABLE PRINCIPLES

All work in the control of forest fires may be divided into four broad functions. The number of individuals it may take to efficiently and effectively do the work characteristic of each function depends mainly upon the number of men and machines required for the fire suppression job, accessibility and behavior of the fire.

In brief the four major functions common to all except the "one man" fire are:

The Plans function, which is the collection and analysis of information pertaining to the fire and the development of this information into a detailed plan of operation for control purposes.

The Service function, which is the procurement, maintenance and physical distribution of men and machines at the time and place called for in the suppression plan.

The Line function, which is the safe, prompt and thorough execution of the control, mop-up and patrol plans prepared for the particular fire to be controlled.

The Command function, which is the knitting together and the coordinated management of the Plans, Service and Line functions in a manner that will assure the equipment and men on the fire are used and directed efficiently and adequately.

On fires with a light job load all upper level work of the foregoing functions may be performed by a Fire Boss and the individual in charge of the field fire headquarters. As the fire job load increases staff assistants and line overhead are progressively added to the organization to assure efficient use of men and equipment.

The four primary functions are more fully described in the following paragraphs:

a. The Plans Function

1. Policy - Know Policies, accept them and see that they are applied. It is essential that preliminary plans be made immediately after the fire escapes the initial

attacking force to provide time for control forces to arrive at the fire for effective work during the first work period. Adequate planning is also essential to assure adequate control forces are available for each succeeding work period until the fire is controlled.

2. Gather and Compile all Facts as follows:

(a) Physical Conditions Associated with the Fire Operation

Cover types and fuels in the immediate vicinity and beyond the fire area that will increase or decrease spread.

Current dryness of fuels, time of day and year.

Immediate slope, elevations and/or topographic characteristics within and beyond the fire area.

Barriers that will reduce spread or which can be used to hasten line construction.

Unsafe and dangerous conditions for men.

Status of control.

Current location of the limits of the fire and its probable location at future time intervals.

Accessibility as it applies to the general fire area and in detail for its various sectors.

Potential camp locations; water and in what amount and where.

Soil conditions.

Information on values -- both structural and natural in the fire area.

Types of equipment required for constructing and holding line.

Availability of management and supervisory personnel, line forces, specialists, equipment and facilitating gear.

Probable rate of line construction per unit of manpower or machine by sectors of planned fire perimeter to be worked.

(b) Weather Conditions

Information on weather is essential in the preparation of strategy plans for control of all fires; also essential for the selection of the most effective tactics to be employed. Where necessary this information must be available by major sectors of the fire. Data must be obtained on current and predicted wind velocity and direction; temperature and predicted changes; current and future relative humidity; current and forecasted fuel moisture.

(c) Records, Maps and Statistics

It is important to planning to compile all meteorological data, logistics and other information in the form of maps and statistics at the time specified to allow rapid clear-cut decisions on location of the fire at predetermined time intervals, on questions of strategy, tactics to be employed and the organization needed for control.

- 3. Analysis of Facts Such an analysis involves definition of the problems, coordinating, correlating and calculating, preparatory to making up the plan for control; often to provide simultaneous coordinated action in several directions. To simplify procedure, two stage analysis is recommended:
 - a. Proposed location of fire line.
 - b. Facilities needed to construct and hold this line.
- 4. Planning This function includes preparation of operation plans in homogeneous units and alternate plans where needed. It calls for information on extent of the job, priorities, sequences and time elements, and requires a current flow of information on the resources, services and facilities needed to execute the plan or alternate plans; and determination of the specific organization required to implement the plans. It involves development of a Communication Plan for the fire operation.
- 5. Demobilization On most fire operations certain parts of the fire perimeter are controlled before others; for example the "rear" and "flanks" of a fire may be controlled before the "head." It is the responsibility of those in charge of the Plans function to keep current information on the status of control on all portions of the fire perimeter. As certain sectors of the fire

perimeter are brought under control it is the responsibility of the Plans Unit to correlate this information and prepare demobilization plans for review and approval by the Fire Boss as fire operations proceed making such action possible.

6. Major Plans Decisions the Responsibility of the Fire Boss - Details of the Plans work can be performed by others but in final analysis the Fire Boss must make the major Control Plan decisions and approve final organization plans for each shift on a fire or during interim periods when emergencies require such changes.

b. The Service Function

- 1. Men Large numbers of men are required on many project fires. These men must receive proper care to be most efficient. Commissary such as tobacco and clothing may be needed; sanitation facilities must be provided, etc. Care of personal gear, particularly the gear brought in by men from other forests or regions is of great importance.
- 2. Camp Management Camps may be required with facilities to feed clean, well balanced and well prepared meals; provisions must be made for sleeping and rest areas.
- 3. Timekeeping Accurate timekeeping facilities must be established to assure that fire fighters or owners of rented equipment are paid amounts due them.
- h. Transportation and 0 ther Equipment Equipment must be provided to haul the men and the tools they use to and from fires. Such equipment must be serviced and maintained. Large equipment such as tractor drawn plows, tractor-dozers, prime movers, and air-craft is often used; maintenance and servicing such equipment is important to an efficient operation. Hand tools, such as axes, brush hooks, electric head-lamps, back pack pumps and other similar equipment must be available in the quantities needed and maintained in highly serviceable condition to assure effective production by the men who use them.
- 5. Communication from the fire camp or camps to the dispatching center, to various parts of the fire and between various sectors and divisions either by radio or telephone is important to all fire operations. It must be established in accordance with Plans developed by the Plans Unit.

- 6. Procurement and safe distribution of supplies, equipment, manpower and overhead to meet time limitations imposed by the demands of the fire and as dictated by plans approved by the managerial head (Fire Boss) is an important function on all fires.
- 7. First Aid and Care for the Sick and Injured Facilities must be provided for this purpose.
- 8. Demobilization Time of fire fighters and rented equipment, to assure rapid payment, must be posted and audited insofar as field conditions will permit. Equipment must be returned. Men must be transported to their destinations. Food stuff must be inventoried, etc.

Of the four major functions on a fire, the Service function is one of the most troublesome for the Fire Boss to handle. It is one of the easiest functions for which relief may be provided by assignment of qualified personnel. It is this function, more than any other, that so often occupies the time of a Fire Boss when he should be doing high level work in his other primary functions. Failures in this function are so often the cause of ineffectual and expensive control efforts. For these reasons the Service function should be staffed adequately.

c. The Line Function

Following completion of the detailed plan of strategy for the control of a fire, determination of the tactics to be employed and the general location of fire lines to be constructed, the job of control must be undertaken without loss of time. This entails several specific activities.

- 1. The fire line must be located in sufficient detail on the ground for the benefit of the line overhead and forces charged with the responsibility of constructing and holding it.
- 2. Spot fires must be detected and controlled.
- 3. Line must be cleared of brush or other aerial fuels and down material. Clearing the line to mineral soil by scraping, digging, and trenching with hand tools or power equipment or both is required. Snags both inside and immediately outside the fire line may have to be felled.

- 4. Burning out the area between the fire edge and the fire line may be necessary.
- 5. The fire must be mopped-up, and while this is in progress a holding crew may be required.
- 6. All operations must be inspected to make certain they are being handled in an efficient manner. They must meet a time sequence previously established.
- 7. Finally patrol must be established until the fire is declared out or safe to abandon.
- 8. Safety must be the watchword.

d. The Command Function

The three primary functions - Plans, Service and Line - must be knit together to assure that fire operations proceed smoothly. This is done by uniting all functions into an organization setup in a manner which will permit the most effective and forceful execution of the job characterizing each primary function. Factors to Consider:

- Policy Know policies, accept them and see they are applied.
- 2. Making Assignments Functions must not overlap between individuals. Each individual should have some knowledge of the duties and responsibilities of those working with him. Every functional job on a fire must be assigned to some individual. One individual usually has several jobs assigned to him on the smaller fires, i.e., the Camp Boss may handle communication, supply, equipment, etc., on fires with a light job load. Give each man a full job, then assign extra help only as needed.

Avoid working men long hours which results in excessive fatigue, injury to their health, and poor fire management. Provision should be made for enough overhead to enable men in responsible positions to get adequate rest.

- 3. Unity of Command Each person must know to whom he reports, who reports to him. He must be fully informed as to his responsibility and authority. Each person reports to only one superior.
- 4. Delegation of Authority The responsibilities assigned must be supported with full authority to act. Clearly define the type of action on which each level of boss (Sector Boss, Crew Boss, etc.) is free to make his own

decisions and those which require approval of his immediate superior. There must be prompt, complete and on-the-line acceptance of responsibility. Do not retain sole decision authority at the top. Limit the number of delegations to those essential to the current needs of the job. It is good practice to delegate decision making as close to the job as possible.

- 5. Avoid Over Staffing The organization for a particular fire operation should not be super-staffed or larger than that required by the job to be done. There are situations, however, where such factors as fuels, climatological elements, terrain, are so delicately balanced that the chances for a "blow-up" are imminent. When a situation with this potential develops management should get set for adversity. This means alerting those individuals in the early stages of a fire whose capabilities would be needed should the job develop into a "full staff" deal. It also means using those potential "Plans", "Service" and/or "Line" men on jobs in parallel but lower functional fields until definite staff expansion appears highly probable. Under such circumstances a man capable of filling the Service Chief's position would probably operate as Camp Boss until expansion was necessary: similarly the Plans Chief may operate as Information Officer or a Line Boss may serve as Division Boss.
- 6. Execution Execution is conversion of the plan of operation into action. It entails provision for adequate supervision and follow-up. Attainment of adequate supervision and follow-up can be assured if the following actions are taken:
 - (a) Select personnel based on previous training and experience for each planning, supervisory or facilitating overhead position on a fire.
 - (b) Place the best qualified man available in each position, with preselected and trained alternates when necessary. Allocate equipment to the tasks for which best suited.
 - (c) Issue clear-cut and easily understood written instructions for each overhead position in the suppression organization. Corollary to this such instructions should avoid duplication, overlaps in responsibilities, or duties, or omissions.
 - (d) Recognize the need for and provide a "behind the lines" organization to procure and dispatch man-power, equipment, supplies, and facilitating gear ordered by the Fire Boss or his assistants authorized to act for him.

- (e) Assign one individual to serve as managerial head of the fire operation. Make it known to all those who serve under his direction that his decisions are final.
- 7. Employee Relations Be alert to personal problems, safety and welfare of personnel. Maintain discipline, both organizational and individual. Insist that overhead fulfill their responsibilities. Do not permit individual violation of rules and instructions. Keep personnel informed of fire progress and interesting events that may occur on the job and in their home area.
- 8. Safety and Training See that previously prepared Safety and Training Plans are put into effect, immediately operations are initiated.

CLOSE COLLABORATION BETWEEN PLANS, SERVICE AND LINE OF-FICERS IS ESSENTIAL. LINE OFFICERS SHOULD NOT CONSIDER THAT PLANNING IS AN EXCLUSIVE FUNCTION OF THE PLANS UNIT. SUCH OFFICERS HAVE CERTAIN RESPONSIBILITIES IN PLANNING AND SERVICING AT THEIR JOB LEVELS. FIELD DECISIONS AND IMMEDIATE PLANS OFTEN MUST BE MADE AND ACTION TAKEN TO MEET LOCAL CONDITIONS SUCH AS SUDDEN CHANGES IN WIND, OC-CURRENCE OF SPOT FIRES, SLOP-OVERS, ETC. THE DIVISION, SECTOR AND CREW BOSSES MUST PLAN HOW BEST TO UTILIZE THEIR RESOURCES TO MEET UNEXPECTED CONDITIONS. SUBSEQUENT ACTION SHOULD BE REPORTED TO THE IMMEDIATE SUPERIOR WITHOUT DELAY.

SIMILARLY LINE OFFICERS SHOULD NOT CONSIDER THAT THE SERVICE UNIT WILL DO ALL OF THE ADVANCE THINKING FOR THEM. THEY MUST MAKE THEIR NEEDS KNOWN. THEY MUST ALSO ASSUME CERTAIN SERVICE RESPONSIBILITIES THAT ARE A PART OF THEIR JOB ON THE LINE, SUCH AS SHARPENING TOOLS ON THE LINE, DISTRIBUTING LUNCHES. CARING FOR THE INJURED, etc.

D. PLANNING THE FIRE CONTROL ORGANIZATION

Organization, balanced in all its phases is essential and vitally important to successful fire control operations. Organization of men and equipment by sectors and the fire as a whole and preparation of specific written instructions and supporting maps is a specific and important function on every fire requiring an organization for control. This organization work must be done very quickly and must be correct in all details to assure success.

The size of a fire measured in terms of its perimeter is not the controlling factor when determining the organization needed to control it. Nor is the area of the fire the primary factor to consider when organizing for control. Some fires, 1,000 to 5,000 acres in size have been controlled with 25 to 50 men while others from 500 to 1000 acres in size have required from 200 to 400 fire fighters for control. Obviously, the organization for the 5,000 acre fire mentioned above would be very simple compared to the organization required for fires having a fire job load requiring 200 to 400 men per shift.

The fire job load for each segment of the perimeter requiring control measured in terms of what is needed to quickly and efficiently control the fire, correlated with fire behavior and terrain features, is the determining factor when estimating the organizational requirements for control.

a. Factors Affecting the Fire Job Load:

The resistance of the fuels along control lines to line construction and holding per unit of manpower or machine.

Resistance to mop-up operations.

Accessibility of the various sectors to attack forces and mobility of forces along the fire perimeter.

Climatological conditions as they affect current and forecasted rates of spread and fire behavior.

Available communication facilities.

Efficiency and physical fitness of available manpower and overhead.

Morale of workers.

Danger to the men.

Elevation and temperature as they affect the ability of men to endure long periods of arduous work.

Values, tangible and intangible endangered by the fire.

Type, quantity and quality of equipment that can be mobilized.

Terrain - whether broken, steep, level, moderate.

Messing and sleeping facilities available.

Time available for control.

The foregoing factors must be analyzed and correlated in detail before the type and size of the organization required to control a fire may be determined.

AS A GENERAL PRINCIPLE NO FIRE BOSS CAN DETERMINE THE ORGANIZATION PATTERN TO APPLY WITHOUT FIRST ESTABLISHING THE CONTROL TIME SCHEDULE FOR THE VARIOUS OPERATIONS ON A FIRE AND THEN CALCULATING THE FIRE JOB LOAD INVOLVED IN SUCH CONTROL OPERATIONS IN TERMS OF NUMBERS OF FIRE FIGHTERS, EQUIPMENT AND FACILITATING GEAR NEEDED TO MEET THE SCHEDULE. WHEN MAKING THIS DETERMINATION THE FIRE BOSS MUST WEIGH THE FACTORS OF ACCESSIBILITY AND BEHAVIOR AS THEY AFFECT THE MANAGEMENT OF MEN AND EQUIPMENT.

In the development of the Organization pattern the help that may be available from local Cooperators and key men should not be overlooked.

b. Span of Control in Organizing for Fire Suppression Operations

There is a practical limit to the number of units one person can direct. No individual occupying a Command, Service, Plans, or Line position on a fire should have more personnel or machines working than he can effectively supervise and manage. Other jobs assigned to an individual such as Planning by the Fire Boss reduces the time available to supervise personnel and work machines. No set ratios may be applied "straight across the board" concerning the number of fire fighters or pieces of equipment under one boss or the number of lower level supervisory personnel under the direction of another individual. However, when setting up organizations for control this factor must be considered in each case. The following organizations are proposed with this in view:

E. SUGCESTED FIRE CONTROL ORGANIZATIONS

a. Basic Organization Guides

It is recognized that all fires will not fall precisely into one of the following fire job loads. Fire management must determine the Organization for each fire. These examples are provided to guide the thinking of fire management personnel.

1. The One Man Fire - The Two Man Fire - Consider the simplest fire where one man makes successful attack. There is no organization except the "behind-the-lines" organization supporting him such as dispatching, servicing, etc. The individual has no one to supervise. Hence there are no Command duties. He calculates probabilities, determines the plan of strategy to apply to control the fire, selects tactics to employ, does all the line work required; services himself such as obtaining drinking water, etc. This individual is in charge of the three primary functions: Plans, Line and Service. This is possible since the amount of thinking and work involved in effectively doing the non physical jobs that needs to be done are not great. The physical work involved in the construction of held line is his greatest effort. The one man fire is the simplest phase of all fire operations measured in terms of the "on-the-line" organizational requirements.

Adding one man to the force on the fire changes the situation. When two men are working, someone must be boss. On a fire this man is termed the Fire Boss by the U.S. Forest Service. Directing the second man takes some time - the Command function is added to his duties. The welfare of the second man must be considered. The fire can be attacked in two places when but one was possible before. It can be seen more time must be spent by the first man (the boss) in planning, directing, supervising, inspecting and servicing than before with somewhat less time remaining available for actual line construction; although the greatest part of the boss' time will be spent in construction of fire line where only one other man is involved.

2. The Small Suppression Crew Fire (6 line workers) Assume there is a fire requiring a small suppression
crew to effect control. It can be seen that as the
number of line workers is increased more and more
of the time of the Fire Boss is taken up with such
duties as scouting, planning the strategy for control,
location of line, supervising and directing the work
of the line workers, seeing that the men get water,
are fed, and other similar work. The Fire Boss spends
less time in actual line construction compared to the
case where he has but one man to supervise.

Functional responsibilities: The Fire Boss of a six man crew is charged with all Line, Plans, Command and Service functions.

The basic fire organization proposed to manage a fire requiring six line workers per shift is shown on Chart 1.

The foregoing organization is based solely on manpower. Assume a plow unit is used to construct the fire line. The Fire Boss position remains unchanged. However, the Fire Boss, in addition to knowing how, (1) to "size-up" the fire and formulate plans for control, (2) to activate the suppression plan, and (3) to direct and supervise his men must know how to effectively apply the tractor plow unit to the control job. Also since the fire line will be constructed with mechanized equipment an operator specialized in plow operation in all its phases is required. Usually when plow units are used the line must be "burned-out"; following burning out operations the line must be mopped up and while these activities are going on holding forces are required. On fires having a fire job load requiring a Fire Boss, one Plow Unit, an operator to operate the Unit, and 2 or 3 men for burning out, mop-up, and holding the organization usually conforms to the following pattern:

A Mire Boss who "sizes-up" the fire, formulates plans for control, locates the line, and activates and directs control forces.

An Operator who plows the line located by the Fire Boss.

A position to "burn out" the plowed line.

Two more positions to hold the line while "burning out" is progressing.

After the line has been completed around the fire and "burned out", the entire crew, immediately undertakes the job of mopup, and, while this work is in progress, holds the fire line against possible "slop-overs." The amount of mop-up needed varies with the type of fuel and other conditions.

Assume a tanker unit is used to control a fire. The Fire Boss position remains unchanged excepting the incumbent must be intimately acquainted with tanker operations and the use of water in controlling a fire.

The Organization for a fire with a fire job load requiring one tank truck, an Operator and 2 or 3 men for control usually conforms to the following pattern:

A Fire Boss who "sizes-up" the fire, formulates plans for control, selects point or points of attack, and activates and directs control forces.

An Operator who manoeuvers the tanker as directed by the Fire Boss and helps operate the pumping unit, and when possible, pulls hose, etc.

A nozzle man who, with the Fire Boss directs the stream of water on the fire.

One or two positions - usually to help with the job of pulling hose, of opening a path for the nozzle man or to handle such other tasks as required.

After the fire has been "knocked-down" all members of the crew undertake the job of line construction and while this is in progress holds the fire in check until the fire line is completed. Following completion of the line the fire is mopped-up with water or hand tools; usually a combination of both.

3. The Medium Suppression Crew Fire (14 line workers) -Consider the situation where It line workers and the Fire Boss constitute the control force. The work involved in planning effective use of line forces becomes greater as the number employed increases. The time spent by the boss in supervision and direction of line work increases if no assistance is provided. More time is involved making certain the men have food, have water and are provided with an opportunity for rest. total time available to the Fire Boss is not sufficient to handle all functional activities. Some means must be found to relieve him of part of his work. The simplest means of doing this is to relieve him of the intimate job of directing the work of the individual crew members. This can be done by assigning their direction to other individuals. But this poses the question; how many subbosses will be needed?

Most fire fighters (workers) on large fires are untrained or at best not well trained in the art of fire fighting, in using the tools commonly employed or in the U.S. Forest Service type of fire organization established to control fires. What is the maximum size

crew a sub-boss (Straw Boss) can direct and supervise? The number could conceivably be 10 if each man occupying a position in the crew were a fully trained fire fighter. However, this is so rarely the case on large fires that, for all intents and purposes, it may be eliminated from consideration.

Considering the "mill-run" type of fire fighter, six line workers are about the maximum that should be assigned to a Straw Boss to supervise and direct. Under some circumstances the number of workers per subcrew will vary downward with terrain, fire behavior, job to be done and degree of training of both workers and Straw Bosses. It is conceivable that under the most adverse conditions the number of men to be assigned to a Straw Boss may be quite low - in the neighborhood of three workers.

Two Straw Bosses normally, are assigned to a crew of 12 men; each to direct the work of six line workers. Straw Bosses are line workers. Hence they constitute part of the force of fourteen line workers.

The man in charge of the fire actually assumes the importance of a Fire Boss on a fire where the overall calculated fire jobload is light - not more than fourteen men. He is termed a Medium Suppression Crew Fire Boss and excepting for the direction of individual crew men has charge of all activities including the direction of two Straw Bosses. He will build some line himself but most of his time will be devoted to other work such as Commanding, Planning and Servicing.

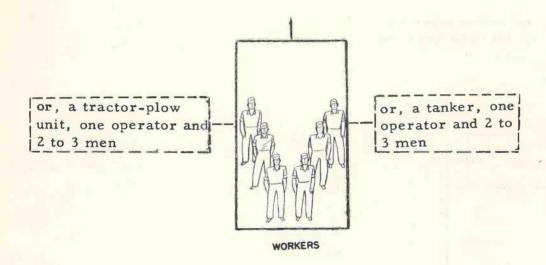
Functional responsibilities: The Fire Boss is charged with all Line, Plans and Service functions. He also is fully responsible for Command except that he releases some of his Command duties to the Straw Bosses who are assigned the job of directing workers in their respective crews.

The basic fire organization proposed to manage a fire requiring 14 line workers per shift is shown on Chart 2.

The substitution of a Plow Unit or tanker for the basic manpower organization changes in a minor way the type of organization to apply to the control job. For the type of line organization to apply refer to the discussion under E-a-3.



Fire Boss



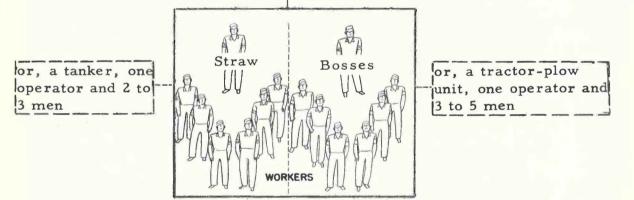
SMALL SUPPRESSION CREW FIRE

(6 Line Workers)

Basic Fire Organization Proposed to Manage a Fire
Requiring 6 Line Workers per Shift



Number of workers per Sub-Crew will vary with terrain, fire behavior, job to be done and degree of training of workers and straw bosses.



MEDIUM SUPPRESSION CREW FIRE
(14 Line Workers)

Basic Fire Organization Proposed to Manage a
Fire Requiring 14 Men Per Shift

4. The Large Crew Fire (21 line workers) - Increasing the number of line workers from 14 to 21 normally requires the employment of three Straw Bosses. It can be seen that the time required to supervise and direct the work of three Straw Bosses has increased compared to (3) above, leaving less time available for the Fire Boss to handle his Plans and Service activities. The Fire Boss in final analysis must have adequate time for his Plans work. It can never be slighted. He must have time, also, to manage that portion of the Line, Service and Command functional work that must be retained by him. The only way these objectives may be realized is to relieve him of the details of the Line and certain Command functional activities. This can be accomplished by assigning one or more individuals (Crew Bosses) to supervise and direct the Straw Bosses. How many Crew Bosses is the question.

Crew Bosses normally have other duties such as details of line location, welfare and safety of men in addition to their primary job of directing the work of Straw Bosses. As a general rule, Crew Bosses should not be expected to direct more than three Straw Bosses who are not fully trained. If the Straw Bosses are well trained a Crew Boss may be able to direct effectively four Straw Bosses - never more.

Since it is a sound principle for a boss to be close to those he directs, terrain has some bearing on the number of subordinates who can be directed effectively. This is an important consideration and in rough terrain the number of Straw Bosses a Crew Boss can direct may be reduced from 4 to 3 if they are well trained; if the Straw Bosses are not well trained it is conceivable that the number of such men a Crew Boss can direct may drop to as low as two.

Fire behavior, also, has a bearing on the number of Straw Bosses. If the behavior of the fire presents a potential danger to the men the number of Straw Bosses assigned to a Crew Boss should be less than the normal standard of 3 to 4.

The Crew Boss, under this organization setup, supervises and directs the activities of the Straw Bosses, handles details of line work and helps the Fire Boss with his line scouting and Service activities.

This type of organization makes it possible to attack the fire in two or more places which is of tremendous aid in the control of small fires.

The Fire Boss under the foregoing conditions is termed a Large Crew Fire Boss.

Functional responsibilities: The Fire
Boss retains all Plans and major Service,
Command and Line responsibilities. The
Crew Boss has both Command and Line functional duties pertaining to his supervision
and direction of the Straw Bosses in their
line activities. He also has minor Service
and Plans function responsibilities. The
Straw Bosses have that part of the Command
and Line responsibilities pertaining to the
supervision and direction of men under them.

The basic fire organization proposed to manage a fire requiring 21 workers per shift is shown on Chart 3.

5. The Multiple Crew Fire (63 line workers) - If the fire job load increases from one requiring 21 line workers to 63 line workers the same general Line Organization as shown under (4) above is required excepting for the addition of the required number of Straw Bosses to direct the additional line workers and Crew Bosses to supervise their work. For 63 line workers, 9 Straw Bosses and 3 Crew Bosses would meet normal requirements. (Straw Bosses are included in the number of line workers.)

If the fire is burning in a highly accessible area the Fire Boss is usually able to accomplish the necessary informational work (scouting). Conversely, if the fire is burning in rough terrain or its behavior is potentially serious it may be necessary to assign a scouting position to reduce the load on the Fire Boss; thus providing him with more time to plan and direct the overall operation.

When as many as 63 line workers, including Straw Bosses, are employed, timekeeping, feeding, communication, transportation, safety and similar work have increased to a degree making it impossible for the Fire Boss to handle all of it. A Camp Boss position to plan, supervise and perform the duties of the Service function involved in a simple servicing operation will be necessary and must

be added to the Organization to make it operate efficiently. The Camp Boss must have kitchen help to prepare and serve the meals. He also must have a tool maintenance man to recondition tools as required. In most cases fires involving about 63 line workers require an individual specifically assigned to the timekeeping activity.

In the event no fire camp is provided for messing and sleeping men a fire headquarters must be provided and a position comparable to that of the Camp Boss set-up to manage the fire headquarters, timekeeping, transportation, etc.

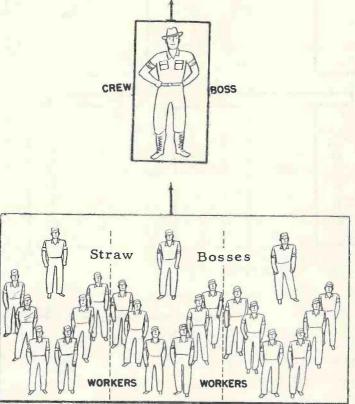
The individual assigned the job of managing the above described organization is called the Multiple Crew Fire Boss.

Functional responsibilities: All Plans work is retained by the Fire Boss, with major Service decisions, Line and Command function work also retained; all supplies, communications and equipment work pertaining to the Service function excepting tool maintenance is personally handled by the Camp Boss. Cook and flunky help are assigned to the Service function as needed. Thus the Command functions as they pertain to men engaged in Service work are vested with the Camp Boss. The Line and Command functions and minor Service and Plans work pertaining to Straw Bosses and their Crews are vested with Crew Bosses. Similarly the Line and Command functions pertaining to fire fighters are vested with the Straw Bosses.

The basic fire organization proposed to manage a fire requiring 63 line workers per shift is shown on Chart h.



Fire Boss



Number of workers per Sub-Crew will vary with terrain, fire behavior, job to be done and degree of training of workers and straw bosses.

Tractor-dozer, tractor-plow or tanker units may be substituted, in part for the workers. When this is done a special Equipment Boss will replace the Crew Boss; also Operators for the equipment will be required.

LARGE CREW FIRE

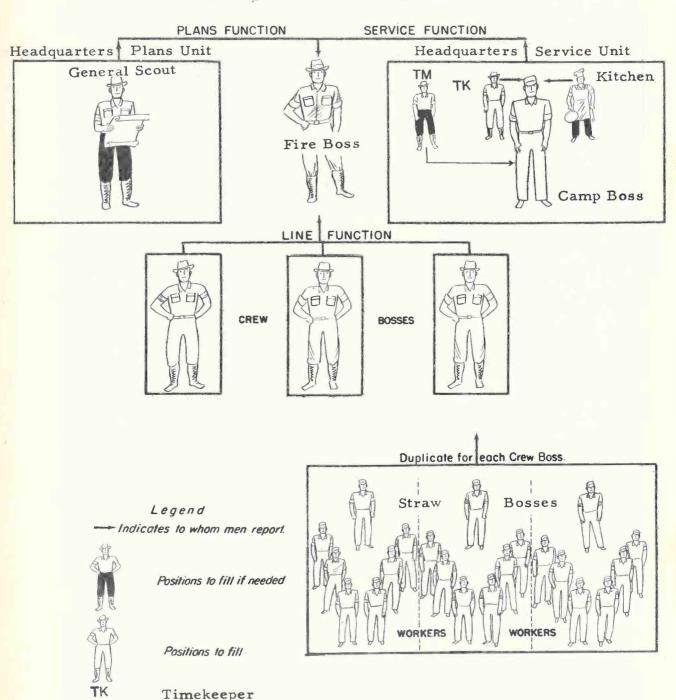
(21 Line Workers)

Basic Fire Organization Proposed to Manage a Fire Requiring 21 Line Workers per Shift

MULTIPLE CREW FIRE

(63 Line Workers)

Basic Fire Organization Proposed to Manage a Fire Requiring 63 Line Workers per Shift



Number of: (1) Workers per Sub-Crew, (2) Straw Bosses per Crew Boss, (3) Crew Bosses per Fire Boss and, (4) Service and Plans Overhead will vary with terrain, fire behavior, job to be done and degree of training of individuals involved. Avoid weak or excessive staffing of the fire organization.

Tool Maintenance

Identification of the positions on Chart 4 and other Charts which follow and which are otherwise not identified on the Charts follow:

LINE FUNCTION PLANS FUNCTION

Fire Boss	-	FB	Plans Chief	-	PC
Division Boss	-	DB	Information Officer	-	IO
Line Scout	-	LS	Maps & Records Officer	-	MR
Line Locator	and the	LL	General Scout	-	GS
Line Inspector	-	LI	Weather Forecaster	ness,	F
Safety Officer	-	SO SO	Photo Interpreter	-	PI
Line Boss	1000	LB.	Financial Advisor	-	FA

SERVICE FUNCTION

Service Chief	-	SC
Supply Officer	-	S
Camp Boss	-	CB
Air Officer	-	AO
Equipment Officer	-	EO
Communication Officer	***	CO
Timekeeper	elen.	TK
Tool Maintenance	-	TM
Kitchen	-	K
Transportation Officer	-	TO

6. The Two Sector Fire (126 line workers) - If the fire job load for a fire requires the employment of 126 line workers per shift the Fire Boss does not have time to give personal direction to the Crew Bosses without lowering standards applying to the Plans function. In the organization depicted on Chart 4, the Fire Boss normally would have direct charge of three Crew Bosses, a Camp Boss, and probably a Scout. Appreciably increasing the number of personnel for him to supervise would not leave him sufficient time to perform his other duties. These duties involve major Service and Supply decisions, securing information on which to base decisions, and planning strategy and tactics for control. They cannot be slighted.

Managing 126 men normally requires the employment of 6 Crew Bosses. Since it is vital that the Fire Boss keep abreast of the Plans work he cannot delegate this responsibility to others. Because he cannot be relieved of his Plans work, assistance must be provided to supervise and direct the Crew Bosses and otherwise handle much of the Lines work excepting for major decisions.

Supervision of 6 Crew Bosses requires the use of another position to relieve the Fire Boss of the details of line supervision and direction. Individuals assigned to these positions are termed Sector Bosses. But what is a Sector and how many Sector Bosses will the job require?

A Sector is defined as a unit of fire perimeter between designated points of which all parts and activities can be personally inspected by an individual from 3 to 4 times per shift if this proves necessary.

The Sector Boss, like the Crew Boss, has great responsibility for the safety of his men. He must see that the line is located properly. He must in most cases, handle scouting work applying to his sector as it affects the details of line location. He must contact the other Sector Bosses on adjoining sectors. He must cover that portion of his sector 3 to 4 times per shift where circumstances, such as hot line, troublesome line, etc., warrants. These additional duties take time which reduces the time available to direct the work of Crew Bosses. Ordinarily not more than 3 Crew Bosses should be assigned to a Sector Boss. If his other duties are not too heavy and the terrain is not too rough a maximum of 4 Crew Bosses may be assigned provided the behavior of the fire presents no serious danger to the men.

A fire with a fire job load consisting of 126 line workers normally requires the employment of two Sector Bosses.

Numbers of line workers have increased. Additional sleeping and feeding facilities, more communication and equipment and a greater procurement problem confronts the individual handling the Service function. The job has increased to a point requiring the employment of a Service Chief. However, the Service Chief can serve also as Camp Boss, hence no Camp Boss position is usually needed during the shift the Service Chief is on duty. The Service Chief requires some assistance particularly in timekeeping, tool maintenance, and in the kitchen.

Plans work has increased. Some assistance is required. This is accomplished by assigning a Maps and Records Officer to assist the Fire Boss in this phase of his work.

The position provided to manage a fire organization with this fire job load is termed the Two Sector Fire Boss. The Fire Boss for fires of this job load normally directs the work of one Service Chief, Two Sector Bosses, a Maps and Records Officer and probably a scout.

Functional responsibilities: Major responsibility for Line and Command work, and all Plans work excepting some line scouting and details of maps and records work is retained by the Fire Boss; major Service work such as equipment, supply and communication is handled personally by the Service Chief. He also supervises personnel engaged in timekeeping, tool maintenance, and camp operations; the Sector Bosses are charged with Command and Line work pertaining to their respective Crew Bosses and sectors also have minor Service and Plans responsibilities: for functional responsibilities of Crew and Straw Bosses refer to (5) above.

The organization proposed to manage a fire requiring 126 line workers per shift is shown on Chart 5.

7. The Three Sector Fire (189 line workers) - Assume a fire of larger proportions requiring 180 - 200 line workers per shift.

The overall control job is more complex. Scouting needs have increased. There is a greater Service and Supply problem. Planning has become complicated. The time of the Fire Boss is more and more taken up with Plans and Command work. He has less time to devote to detailed direction of line work and practically no time to devote to work involving the Service function.

A Service Chief and an Information Officer are assigned to relieve the Fire Boss of most of the Service work and much of the details of the Plans activity. A Communication Officer and an Equipment Officer are assigned to help the Service Chief. A Camp Boss is provided for each shift. The Information Officer and Service Chief are directed and supervised by the Fire Boss.

If the terrain and fire behavior are a critical hazard to the safety of the men a Safety Officer may be required.

The additional load placed on a Fire Boss, particularly in the Planning and Command fields, does not leave him with sufficient time for detailed management of the line activity if accessibility is poor. However, if the fire does not require more than three or four sectors, it, usually, can be managed as a single division fire. Line activities and the supervision of the Sector Bosses can be assigned to a Line Boss. (This position has formerly been called a Division Boss by some individuals). He represents the Fire Boss and is his field supervisor in suppression action on the fire. He executes the major Line functions of the plan prepared by the Fire Boss.

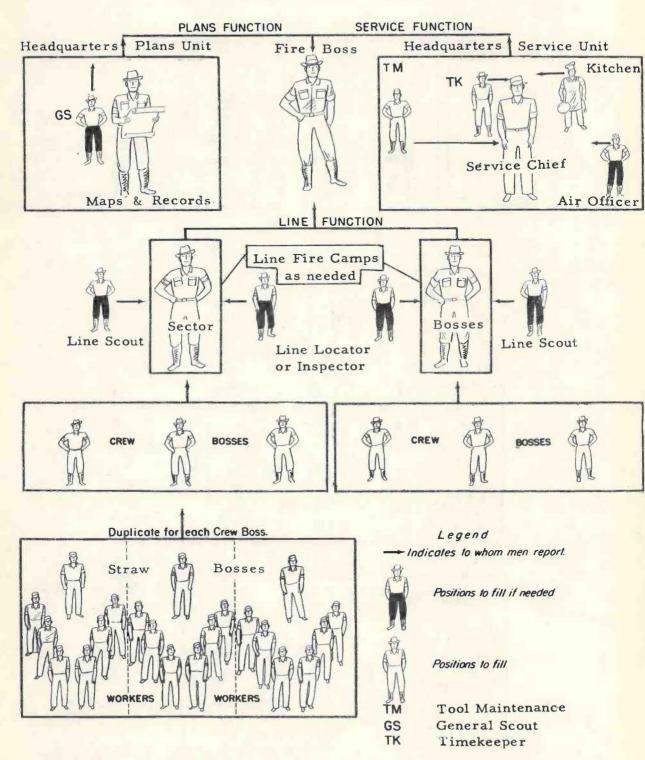
(A Line Boss is not recommended for Three Sector fires characterized by normal behavior and excellent accessibility. Under such circumstances the Fire Boss usually car direct the activities of the three Sector Bosses. Conversely, if accessibility is poor, terrain rough, and the behavior characteristics of a fire indicate that a blow-up may develop, a Line Boss is recommended. He should not be assigned more than Three Sector Bosses to supervise under average "blow-up" conditions and not more than four under ideal conditions.)

The individual handling fires of this class and fire job load is known as the Three Sector Fire Boss and normally supervises the work of one Service Chief, a Line Boss (or 3 Sector Bosses if conditions permit) and an Information Officer in addition to his other important duties such as Planning, etc.

Functional responsibilities: The Plans work excepting for details, major Command and only highly important Line and Service work is retained by the Fire Boss; the Service Chief has Command function duties pertaining to the direction of his men and personally handles the Supply work; the Camp Boss has Command duties pertaining to those he directs; the Line Boss is vested with major Line duties and has that part of the Obmmand function pertaining to the supervision and direction of Sector Bosses; he also has certain Service and Plans work to manage. For functional responsibilities of Sector, Crew and Straw Bosses, refer to (5) and (6) above.

TWO SECTOR FIRE (126 Line Workers)

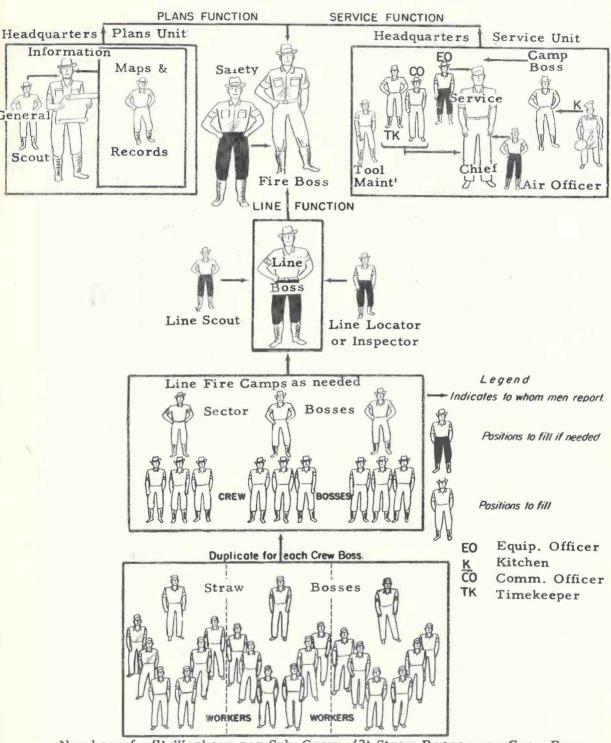
Basic Fire Organization Proposed to Manage a Fire Requiring 126 Line Workers Per Shift



Number of: (1) Workers per Sub-Crew, (2) Straw Bosses per Crew Boss, (3) Crew Bosses, Line Scouts, Inspectors and Locators per Sector Boss and (4) Plans and Service overhead will vary with terrain, job to be done, fire behavior, and degree of training of individuals involved. Avoid weak or excessive staffing of the fire organization.

THREE SECTOR FIRE (189 Line Workers)

Basic Fire Organization Proposed to Manage a Fire Requiring 189 Line Workers per Shift



Number of: (1) Workers per Sub-Crew, (2) Straw Bosses per Crew Boss, (3) Crew Bosses, Line Scouts, Locators and Inspectors per Sector Boss, (4) Sector Bosses per Line Boss or Fire Boss, and (5) Service and Plans overhead will vary with terrain, fire behavior, job to be done, and degree of training of individuals involved. Avoid weak or excessive staffing of the fire organization.

The proposed organization for a fire having a fire job load requiring 189 fire fighters per shift is shown on Chart 6.

8. The Two Division Fire (378 Line Workers) - A Division is a unit of perimeter of a complex fire terminated by topographic or cultural features, of which all parts and activities can be inspected by an individual twice each shift if necessary.

Once a fire reaches proportions exceeding in complexity the normal large fire or its behavior indicates it will not be controlled until it reaches complex proportions, coordination is more difficult, collection of needed information becomes more complex, and inspection and checking work increases. The need for large numbers of men is greater. The organization must be increased to assure that it is adequate and properly balanced to control complex fires having a heavy fire job load.

If 378 line workers are used, 54 Straw, 18 Crew and 6 Sector Bosses usually must be employed to maintain the normal span of control. As numbers of Sector Bosses increase the number will reach a point where one individual will not be able to supervise, inspect and direct their work in the detail required by the Fire Boss.

The supervision, direction and other work involved in managing 6 Sector Bosses is then turned over to Division Bosses. How many Division Bosses will be needed to meet normal requirements?

Division Bosses operate at a higher level than Sector Bosses. They have more freedom of action regarding such matters as line location, burning out operations, etc. They have, for the same fire, greater length of perimeter to cover. Under some circumstances they may supervise division Line Scouts, Line Inspectors, and/or Line Locators. Division Bosses should cover the troublesome sectors of their divisions at least twice per day which in rough terrain reduces the time available to supervise and direct the Sector Bosses. Three Sector Bosses are about the maximum number that can be supervised effectively by one Division Boss - never more than four even under ideal conditions.

Line inspection, location and scouting assumes greater importance. Hence such positions are established on each division when needed. Although Chart 7 indicates

that these positions are placed under the direction of Division Bosses, they may assign these positions to the sector or sectors where they are needed. When so detailed they operate under the command of the Sector Boss to whom assigned.

The time of the Fire Boss is more and more taken up with planning and the duties involving the Command function. He no longer has time for detailed planning work - collecting and correlating information, preparing the Communication Plan, etc., so he assigns a Plans Chief to handle such details for him. On fires of this complexity safety is a problem, and when conditions warrant a Safety Officer must be provided to help the Fire Boss look after the safety of the workers.

Equipment management work is increased, supply problems are magnified. Two positions are required to help the Service Chief in his work, namely, an Equipment Officer and a Supply Officer. If heavy use is being made of privately owned transportation equipment it usually is necessary for the Equipment Officer to have an assistant assigned to manage the transportation. This individual is termed the Transportation Officer. He handles the work included in the Equipment Boss' job description involving transportation management

The Fire Boss is so involved in his planning work and overall command problems that he can devote but little time to detailed line functions. If accessibility is poor or the fire is delicately balanced between "blow-up" and "probable control" he needs someone to help him handle major phases of the line work. This is done by assigning a Line Boss as his field representative to supervise and direct the work of the two Division Bosses.

The Line Boss must be more experienced than the Line Boss assigned to Three Sector fires since Two Division fires are more complex. He executes the line plan prepared by the Fire Boss or may represent him in particularly bad situations on a fire as conditions warrant. A Line Boss is appointed also to serve as the field Commander of the Fire Boss when the Fire Boss, is "off-shift". When serving in this capacity he supervises other Line Bosses who are assigned to supervise and direct the Division Bosses. The minimum number of Division Bosses to be assigned to a Line Boss is two with three being the maximum.

Fires of this complexity and fire job load cost a great deal to control. Large sums can be wasted unless timely calculations are made to acquaint the Fire Boss and Plans Chief with operation costs as plans for control are being formulated. Also current checks must be made to make sure timekeeping, procurement and utilization of control forces and equipment are being managed efficiently. A Financial Advisor (Administrative Services Manager) is assigned the Fire Boss to serve as "watch dog" on expenditures. individual occupying this position does not have authority to dictate what should be done to control the fire. It is his primary responsibility to see that timekeeping, procurement, and similar activities are being carried forward in a business like manner. Also to calculate for the Fire Boss what various operations may cost if, when the plans are being formulated, a choice is possible.

More than one fire camp is normally required when fires of this complexity and fire job load are involved. It is usually sound planning to have one fire camp per division on the fire; never more than two divisions operating out of one fire camp. Consequently, where needed, line camps or small field Service Units are established. When so established they operate under the direct supervision of the appropriate Division Boss. A channel of communication between the Line Camp and the Headquarters Fire Camp is provided since all orders and requests must be channeled through the Headquarters Fire Camp to assure balanced management.

Similarly a Division Boss may require a small field Planning Unit. When such a unit is needed it operates under his control and direction with a channel of communications provided between it and the Headquarters Planning Unit where overall coordination is affected.

The individual placed in charge of fires with the foregoing job loads and planning complexities is termed the Two Division Fire Boss.

Functional responsibilities: The major Plans and Command function, important Line functional decisions and only major Service functional decisions are retained by the Fire Boss; all detailed Plans work and Command of those he directs is under the jurisdiction of the Plans Chief; Line and Command functional activities pertaining to those he directs are vested with the Line Boss when employed; otherwise the Fire Boss; major Service and such Command

functional work, as it applies to those he directs, are vested with the Service Chief; major Line functional duties excepting for major decisions involving departure from Plans, minor Plans and Service duties as they apply to the division, and Command functional work applying to their men are vested with Division Bosses; for functional responsibilities of Sector, Crew and Straw Bosses, Camp Bosses, etc., refer to (5) and (6) above.

The basic fire organization proposed to manage a fire requiring in the neighborhood of 378 line workers per shift is shown on Chart 7.

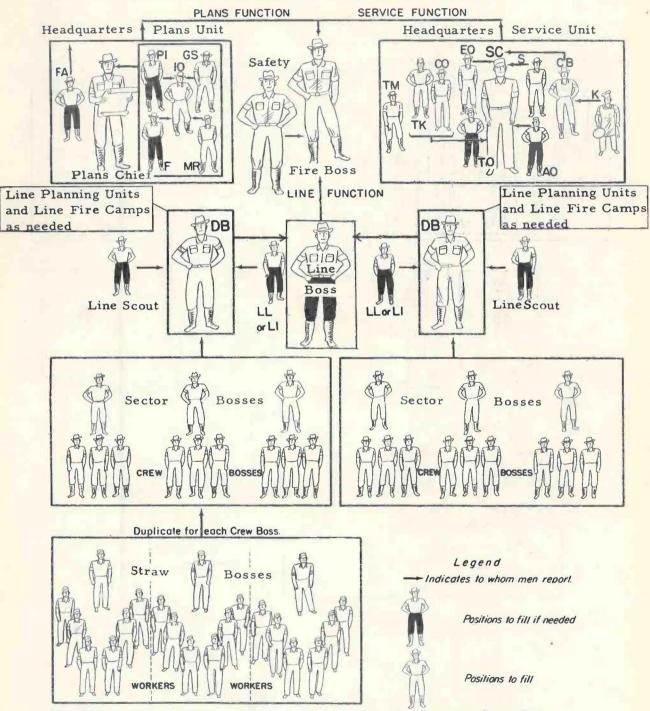
9. The Multiple Division Fire (945 Line Workers) - Management of a fire requiring more than 2 divisions introduces difficulties for the Fire Boss unless he is provided some additional assistance. Two choices are possible. If the fire can be most effectively managed as a single operation, there would not be any great change in the organizational set-up. The primary problem is one dealing with direction and supervision of the Division Bosses and providing facilitating personnel to assist the Plans and Service Chiefs as necessary. This can be resolved by adding another position to assist the Fire Boss in his Line work and to add facilitating personnel as required.

An additional Line Boss position is added who with the other Line Boss associated with the Organization shown on Chart 7, helps supervise and direct the Division Bosses. Line Bosses receive their instructions from the Fire Boss and are responsible to him for fulfillment of his plans as they pertain to the line work on their respective divisions. A Line Boss as previously stated usually cannot direct and supervise the work of more than three Division Bosses. If more than two Line Bosses are needed, the fire should be examined very thoroughly to determine if control should be handled as two separate operations each in charge of a Fire Boss, the independent actions of whom are coordinated by a Fire Coordinator.

Individuals qualified to manage fires involving more than two divisions are termed Multiple Division Fire Bosses.

TWO DIVISION FIRE (378 Line Workers)

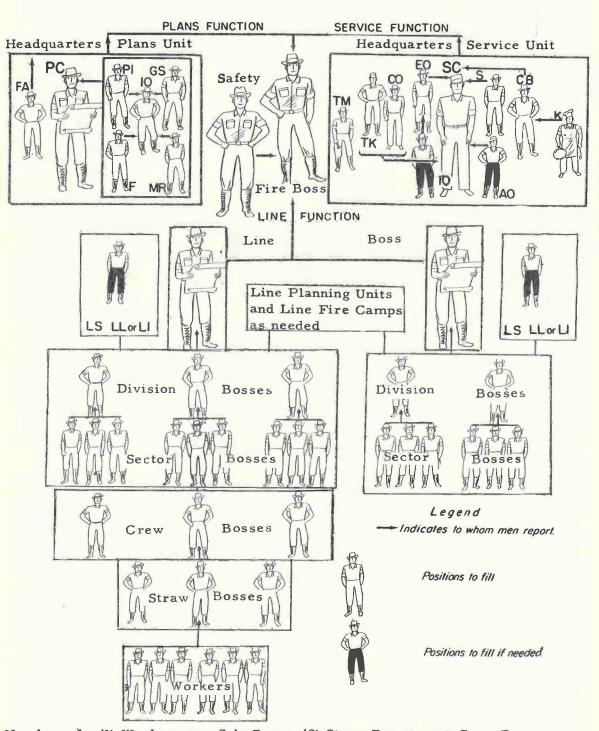
Basic Fire Organization Proposed to Manage a Fire Requiring 378 Line Workers Per Shift



Number of: (1) Workers per Sub-Crew, (2) Straw Bosses per Crew Boss, (3) Crew Bosses per Sector Boss, (4) Sector Bosses, Line Scouts, Locators and Inspectors per Division Boss, (5) Division Bosses per Line Boss, and (6) Service and Plans overhead will vary with terrain, fire behavior, job to be done, and degree of training of individuals involved. Avoid weak or excessive staffing of the fire organization.

MULTIPLE DIVISION FIRE (945 Line Workers)

Basic Fire Organization Proposed to Manage a Fire Requiring 945 Line Workers Per Shift. (Line Fire Camp and Line Planning Organizations Not Shown)



Number of: (1) Workers per Sub-Crew, (2) Straw Bosses per Crew Boss, (3) Crew Bosses per Sector Boss, (4) Sector Bosses, Line Scouts, etc., per Division Boss, (5) Division Bosses per Line Boss, (6) Line Bosses per Fire Boss and, (7) Plans and Service overhead will vary with terrain, fire behavior, job to be done, and degree of training of individuals involved. Avoid weak or excessive staffing of the fire organization.

Functional duties pertaining to such positions as the Fire Boss, Line Bosses, Division Bosses, Plans and Service Chiefs are similar to those described under (8) above.

The basic fire organization proposed to manage a fire that can be controlled as a single operation and requiring up to 5 divisions and 945 line workers per shift is shown on Chart 8.

10. The Coordinator Stage Fire - A fire may be so located that it must be handled as two or more fires. An example of such a situation is typified by a major fire that is burning on both sides of a river or other large drainage. The fire on one side of the river may require separate operational treatment. It may require development of control plans having only secondary relations with the fire on the opposite side of the drainage.

Whenever a fire is so serious and so located it must be handled as two or more separate fires, or whenever two or more complex fires or numerous serious smaller fires in the same general area are in progress, a fire coordinator (Chief Fire Boss) must be appointed whose duties and responsibilities are to:

Handle the liaison work between each fire.

Approve the general plan of control proposed for each day.

Determine territorial limits and general overall plan of action and accomplishments for each fire.

Keep posted on status of control, safety problems and general plan of strategy for each fire and how it fits in with the overall plan for control.

The organization for each fire under the foregoing circumstances will be parallel with the organization discussed under the headings, Multiple Crew, Two Sector, Three Sector, Two Division, or Multiple Division stage fires depending on the complexities and fire job load involved on each fire or parts of a single fire to be operated separately. For example, a part of the fire on one side of the river or drainage may need a Three Sector stage type of fire organization while the fire on the other side of a river may require a Two Division stage organization due to its greater complexity and heavier fire job load.

When fires of such complexities are "underway" a Liaison officer is needed to maintain liaison between the Fire Bosses and the Fire Coordinator or between one agency and another if two separate protection agencies are involved.

b. Specialized Equipment Units and the Fire Organization

The Line control job, for discussion purposes, may be divided into several functions. The first function involves such matters as location, hot spotting, detailed line location and spot fire detection. The next functional job usually involves line cutting, clearing, and scraping, or extinguishing the fire edge with water. A dozer or a plow unit may be used for the clearing and scraping job or a tank truck to extinguish the fire edge with water.

After the line has been located, cleared of brush or down material, scraped to mineral soil, the next functional job may be burning out between the line and the fire edge. After the line is burned out it must be held. A tank truck, a bulldozer or a plow unit may be used to assist in the holding job. Following "holding" comes mop-up. Tank trucks, dozers and power saws may be used in mop-up operations, although the greatest effort usually involves men and hand tools. The last job before abandonment of the fire sector is patrol and inspection. Usually hand labor is involved. However, a tank truck may be used in the final phases of this work if the fire is located along a road.

In many areas equipment such as plows, dozers, tankers, power saws, etc., are employed to construct line or otherwise assist in the control of fires. The use of the equipment serves two control purposes - it may reduce the number of men needed or speed up control.

Tractor dozers, plows, tankers and other specialized equipment when used on a fire should be under the immediate direction of men specialized in this field - i.e., Tractor Dozer, Plow, or Power Saw Bosses, etc.

When these special skills are employed the question arises: where in the organization should they be placed: They should be placed under the direction of the Fire Boss up to and including the Multiple Crew fire and under the direction of Sector Bosses on all other fires. When this is done, the number of Crew Bosses a Fire Boss

is able to supervise must be reduced to allow him time to direct the work of these specialists; similarly when Sector Bosses have such specialists under their direction the number of Crew Bosses they are to supervise must be reduced to permit them sufficient time to direct their activities.

Chart 9 shows the organization on a sector of a fire where a dozer is used to scrape and clear a fire line and power or hand saws are used for smag felling operations. It can be seen that the addition of power equipment does not change the type of organization employed on the sector. The Sector Boss, instead of having a Crew Boss in charge of the clearing and scraping operations, has a Cat Boss to supervise the work of one or more tractor operators. Similarly he substitutes a Power Saw Boss (Falling Boss if hand equipped) for a Crew Boss to supervise the operation of the power saws (or hand outfits) in snag felling work.

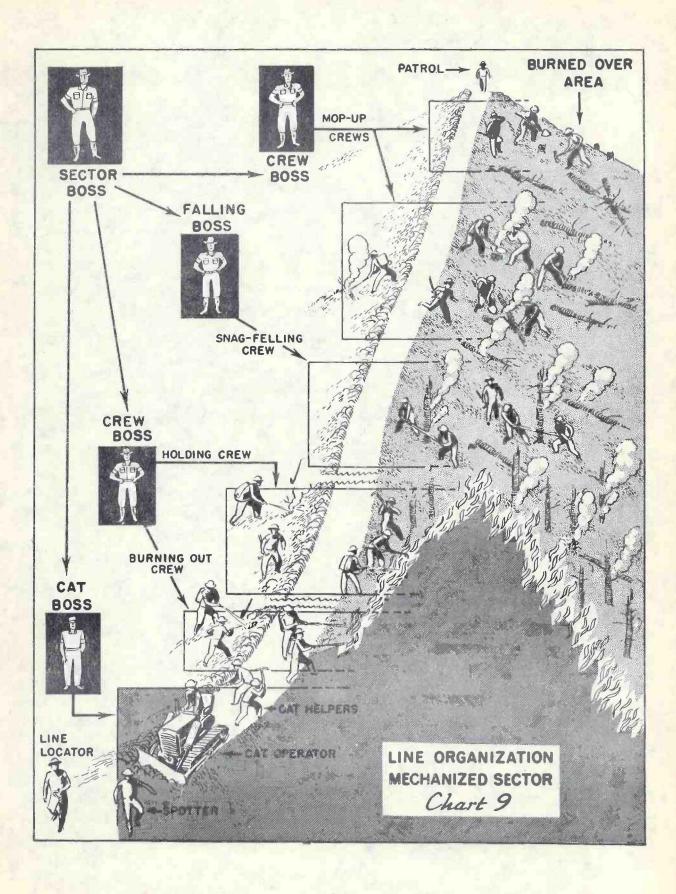
The functional operations as depicted on Chart 9 are a Line Locator who locates the line, a Spotter who locates the details of the route to be followed by the tractor operator, a couple of helpers to "muck out" the line behind the tractor operator and otherwise help him in his work. The Spotter, tractor operator, and helpers are supervised by the Cat Boss who in turn is directed by the Sector Boss. The Line Locator is directed by the Sector Boss or the Sector Boss may handle this work. A burning out crew follows behind the tractor operator an appropriate distance burning out the line and taking care of the immediate line holding needs. This crew is supervised by a Straw Boss, or if the "burning-out" operations are critical by an individual especially skilled in this work. A holding crew (size depending on needs) holds the hot line until "burning-out" has quieted down to an extent relieving the immediate danger of slop-overs. This Crew is supervised by a Straw Boss or Straw Bosses - depending on the job to be done. The Straw Bosses in charge of the burning out and holding operations are supervised by a Crew Boss who operates under the direction of the Sector Boss. As the fire edge cools off snag felling crews proceed along the fire line felling such snags as are on fire or otherwise may prove dangerous. (They may follow the mop-up crew or precede the tractor crew depending on circumstances). If power saws are used a Power Saw Boss is employed who directs the work of the crew. Next a mop-up crew made up largely of men with hand tools completes the mop-up work. These men are supervised by Straw Bosses each reporting to his Crew Boss who in turn reports to the Sector Boss.

A plow could be substituted for the dozer under certain circumstances. Its substitution would not change the type of fire organization. If the dozer line, as shown on Chart 9 had been a road certain minor changes would be required in the organization. The presence of a road from which a backfiring job is to be done would of course eliminate the Spotter, the dozer and the operator and his two swampers, also the Cat Boss. The burning out crew would be required so there would be no change in this phase of the organization. The holding crew would probably use a tanker or two complemented with the required number of men. Hence, a Tanker Boss would replace the Crew Boss and probably would be placed in charge of both the burning out and holding crews. The tanker operator would serve in the capacity of a Straw Boss. It may be seen that although the presence of a road in Chart 9 would change the details of the fire organization on this sector it would not change the type of organization employed.

If for example, this fire were located in an area of no snags the snag felling crew would not be needed, hence the Power Saw Boss would be eliminated from the organization. Again, however, the organization would be changed only in detail and not in its major components.

For example, in the piney woods area of the southeastern states, holding the fire line is a minor problem except for a brief period immediately following burning out operations. There is practically no mop-up work to be done compared to mop-up work required in much of the West or the mountainous areas of the East. Hence in the piney woods area the fire organization on a sector is very simple since the number of men required to locate, construct, burn out, hold and mop-up the fire line is quite small. The primary job is one involving management of equipment and the men who operate such equipment-line locators, burning out, holding, and mop-up forces.

It should be remembered that when a number of tractors, plows, tankers, and power saws are used special direction of such operations are needed each under the direction of a specially qualified boss and equipment crews. These crews may be used as support for line clearing, burning-out, snag felling and line holding crews or may operate independently in either case under the immediate direction of either the Fire Boss or Sector Bosses, depending on circumstances. Each special Equipment Boss' span of control may be either one to two tractors or plows, 3 to 5 tankers, 3 to 5 power saws, 1 to 2 power burners, 4 to 5 portable pumpers, or 3 to 5 hand felling sets.



c. The Fire Headquarters and its Relations with Line Service and Plans Units

A fire headquarters should be established for all fires requiring appreciable reinforcements and is required whether or not men are fed in camp. The establishment of a fire headquarters is important since the dispatcher must know where to send men and equipment. If provision is not made for a fire headquarters it probably will result in men going directly to the fire without being properly instructed as to their operational duties; confusion would be the result.

Each fire of consequence must have a principal Planning Unit. Where men are fed in camp or quantities of equipment are used a Service set-up also should be provided at the fire headquarters. As the fire job load increases it will reach a point where it is not good management to have all of the men on a fire operate out of the Headquarters Fire Camp. The breaking point is usually reached when more than one division organization is operating on a fire during the same shift. Under such circumstances it is usually advisable to have in addition to the Headquarters Service and Planning Units parallel line units for each division operating away from the headquarters set-up. A Division Boss operating out of a Line Fire Camp has additional duties compared to a Division Boss operating out of the fire headquarters set-up. He has increased responsibilities concerning the Service and Plans Units when provided for his division. His relationship with the Service and Plans Units is somewhat similar to that of the Fire Boss with regard to the Headquarters Units although at a so mewhat lower level. By "lower level" is meant that all decisions are subject to review by those in charge of the Plans and Service Units of the Headquarters Fire Camp.

The organization for each Line camp will depend on the number of men and quantity and types of equipment operating out of the camp. It will vary from the very simple Service organization consisting of a Camp Boss, timekeeper, etc., to a more fully staffed Line fire camp organized to handle the Service needs of many men and much equipment.

When Line Service Units are operated the individual in charge reports to the Division Boss and also funnels all his requests for equipment, food stuffs, etc., to the Service Unit of the headquarters set-up. Similarly the simple Plans Unit at the division Line level reports to the Division Boss who coordinates its work with the headquarters Plans Unit. Line Service Units are often assigned

to Sector Bosses and when assigned the Officer in charge reports to the Sector Boss. Rarely are Line Plans Units provided for Sectors.

d. Behind-the-Lines Requirements

Ordinarily after a fire is reported action starts with the fire dispatcher. The Dispatcher fulfills the Plans and Service needs until the Organization is established on the fire.

He, assisted by others, when necessary

Receives, records, and verifies all reports regarding the fire and determines the correct location.

Assigns nearest forces promptly to initial attack.

Determines and activates additional scouting needs if required.

Initiates all follow-up action and designates the field mobilization point and fire headquarters.

Notifies superior officer in charge of the area in which fire is burning of location, action taken, and weather predictions if it looks as though fire will not be controlled by initial attack forces.

When necessary, alerts other Dispatchers and Local and Cooperator Crews.

Notifies local landowners and key community resource managers of the situation and its potential when necessary.

Provides communication facilities during early stages of the fire.

After a Fire Boss has been assigned or following establishment of the Fire Headquarters, fills promptly all requisitions received for overhead, men, supplies and equipment, and keeps Fire Boss informed through channels as to time of delivery at the Fire Headquarters or other designated points.

Keeps fully advised as to the availability of additional crews, specialists, overhead, equipment, food, and all other facilities that may be required for control.

Assists Plans and Service Units on the fire from his central location.

Receives information on demobilization plans and takes such action as he believes necessary to see appropriate parties are informed.

The Dispatcher can handle all the "behind-the-lines" work such as mobilization of manpower, management, supervisory, specialists and other personnel, procurement of food, camp equipment, transportation, specialized equipment, etc., for fires with a light (100 to 250 men) job load. When fires each with a heavy job load are in progress in a common area the "behind-the-lines" work is usually greater than the Dispatcher can handle. When this situation develops the "behind-the-lines" work is accomplished by assigning two "top-level" positions with such assistants as are necessary to handle the work required by the field Service and Plans Units.

Usually mobilization of manpower, overhead and equipment specialists, heavy equipment such as dozers, plows, prime movers, specialized equipment such as power saws, radios, tankers, flame throwers, aircraft, etc., is assigned to the hispatcher.

Procurement of food, camp supplies and equipment, transportation equipment, first aid supplies, gas, oil; headquarters management of timekeeping, other business management functions, etc., are assigned to a headquarters Service and Supply position (usually the Administrative Assistant on a National Forest). He usually has as his assistants, headquarters warehouse men, telephone operators, a transportation officer, purchasing clerk, etc.

The "behind-the-lines" organization is vital to successful operations on fires. Although details pertaining to the type of organization required have been purposely left out of these discussions, this does not minimize its importance to the efficient and effective management of men and machines on the fire.

F. ALTERNATES

Fires lasting more than one shift will require a day and night organization. Stating it another way individuals occupying such positions as Maps and Records Officer, Camp Boss, Line, Division, Sector, Crew and Straw Bosses, etc., must be provided relief so they may obtain proper rest. There are three primary positions on fires lasting beyond the first shift for which alternates are not usually provided. These positions are the Fire Boss, Service and Plans Chiefs. Making no provisions for Alternates does not mean that individuals occupying these three positions are not provided with opportunity for rest. Rest opportunities are provided by assigning a strong Line Boss to handle the line responsibilities of the Fire Boss when he is resting. Similarly a strong Camp Boss handles all Service work for the Service Chief during his rest period in addition to his normal job of operating the fire camp. The Information Officer for the period the Plans Chief is resting handles all Plans work. Usually periods of rest for the foregoing principle positions on a fire are scheduled to coincide with the least dangerous periods of the fire.

This method of operating these three primary positions --Fire Boss, Service and Plans Chief is necessary to assure continuity in executive direction so essential in all fire operations; also continuity of responsibility for the overall fire operation is assured.

G. SUMMARY

Summarizing, the organizational phases for control of forest fires vary from the simple to the complex with the positions to be filled varying in accordance with span of control, the calculated fire job load, and the type of positions required. The Fire Suppression Organization Guide which follows indicates how the positions to be filled on a fire vary with the fire job load measured primarily in terms of line workers.

As power equipment such as power saws, dozers and plows are used the number of line workers, Crew and Straw Bosses will decrease. However, the number of Specialists, such as Cat Bosses, will increase, although not proportionately in all cases. The size of the Service Unit will decrease from that shown in the Guide as the number of men to be served decreases due to the substitution of power equipment except that it will be necessary to increase that part of the Service Unit dealing with the operation, and servicing of heavy power equipment.

The size of the Planning Unit will remain unchanged since the substitution of power equipment for hand tools does not change, downward, the magnitude of the planning job.

FIRE SUPPRESSION ORGANIZATION GUIDE

	POS	OSITIONS TO CONSIDER		CALCULATED FIRE JOB LOAD PER SHIFT NUMBER LINE WORKERS AND PROPOSED ORGANIZATION						COORDI- NATOR
			14	21	63	126	189	378	945	STAGE
		MEDIUM SUPPRESSION CREW								
PROPOSED LINE ORGANIZATION	FIRE BOSS	LARGE CREW								
		MULTIPLE CREW								
		TWO SECTOR							7	
		THREE SECTOR				(11111111111111111111111111111111111111		J Mar		70
		2 DIVISION								
		MULTIPLE DIVISION								
		COORDINATOR								
	FACILITATING LINE PERSON'L	LINE BOSS					////×////	///×///	////2///	
		DIVISION BOSS	100				(//////////////////////////////////////	2///		
		SECTOR BOSS				11//2///	////3///	6	15	
		CREW BOSS			X///3///	6	9	18	45	
		STRAW BOSS	////			18	27	54	135	
			///////////////////////////////////////	X/////////////////////////////////////		XIIIIIIIII				
		LINE INSPECTOR					///////////////////////////////////////			
		LINE LOCATORS				XIIIIII	VIIII			
	1 S V.									
	1	LINE SCOUTS								
	LINE SPE - F CIALISTS LI	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC.	Specialist boss.	ls to serve	under a fire	Specialists bosses as		nder respect	(//////////////////////////////////////	
35	LINE SPE-	PLOW, TRACTOR, TANKER, SAW	100000	ds to serve	under a fire	Opeciansis		nder respect	(//////////////////////////////////////	ige 1 of
PTERS	LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC.	100000	is to serve	under a fire	Opeciansis		nder respect	(//////////////////////////////////////	or stage b load of
DUARTERS	LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF	100000	Is to serve	under a fire	Opeciansis		nder respect	(//////////////////////////////////////	dinator stage ire job load of
EADOUARTERS	LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS	100000	is to serve	under a fire	Opeciansis		nder respect	(//////////////////////////////////////	coordinator stage the fire Job load of
TO HEADOUARTERS	ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER	100000	Is to serve	under a fire	Opeciansis		nder respect	(//////////////////////////////////////	tor
	ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER AIR OFFICER	100000	is to serve	under a fire	Opeciansis		der respect	(//////////////////////////////////////	
OSED	ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER AIR OFFICER EQUIPMENT OFFICER	100000	is to serve	under a fire	Opeciansis	required.	nder respect	(//////////////////////////////////////	Organization for coordinator stage fire depends on the fire Job lood of
PROPOSED	SERVICE ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER AIR OFFICER EQUIPMENT OFFICER SUPPLY OFFICER	100000	Is to serve		Opeciansis		*	(//////////////////////////////////////	
PROPOSED	SERVICE ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER AIR OFFICER EQUIPMENT OFFICER SUPPLY OFFICER TIMEKEEPERS	100000	Is to serve		Opeciansis	required.	*	(//////////////////////////////////////	
PROPOSED	SERVICE ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER AIR OFFICER EQUIPMENT OFFICER SUPPLY OFFICER TIMEKEEPERS PLANS CHIEF	100000	is to serve		Opeciansis	required.	*	(//////////////////////////////////////	
PROPOSED	SERVICE ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER AIR OFFICER EQUIPMENT OFFICER SUPPLY OFFICER TIMEKEEPERS PLANS CHIEF INTELLIGENCE OFFICER	100000	Is to serve		Opeciansis	required.	*	ive sector	
PROPOSED	SERVICE ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER AIR OFFICER EQUIPMENT OFFICER SUPPLY OFFICER TIMEKEEPERS PLANS CHIEF INTELLIGENCE OFFICER RECORD AND MAP OFFICER	100000	Is to serve		Opeciansis	required.	*	(//////////////////////////////////////	
PROPOSED	SERVICE ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER AIR OFFICER EQUIPMENT OFFICER SUPPLY OFFICER TIMEKEEPERS PLANS CHIEF INTELLIGENCE OFFICER RECORD AND MAP OFFICER GENERAL SCOUTS	100000	is to serve		Opeciansis	required.	* * * * * *	ive sector	
PROPOSED	SERVICE ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER AIR OFFICER EQUIPMENT OFFICER TIMEKEEPERS PLANS CHIEF INTELLIGENCE OFFICER RECORD AND MAP OFFICER GENERAL SCOUTS WEATHER FORECASTER	100000	Is to serve		Opeciansis	required.	*	ive sector	
	SERVICE ORGANIZATION LINE SPE-	PLOW, TRACTOR, TANKER, SAW BOSSES, ETC. SERVICE CHIEF CAMP BOSS COMMUNICATION OFFICER AIR OFFICER EQUIPMENT OFFICER SUPPLY OFFICER TIMEKEEPERS PLANS CHIEF INTELLIGENCE OFFICER RECORD AND MAP OFFICER GENERAL SCOUTS WEATHER FORECASTER PHOTO INTERPRETER	100000	Is to serve		Opeciansis	required.	* * * * * *	ive sector	

^{* =} Fill if needed

^{** =} Provide Line Service Organization as needed

** = Provide Line Planning Units as needed

APPENDIX

A. JOB DESCRIPTIONS

The following pages list the titles, responsibilities and duties of most of the positions used in control of fires.

a. Fire Boss

Certain fires require but one man to control, others up to 20-60 or 250 men, with some fires requiring 1,000 men or more. Some are handled as two or more fires. Each requires a Fire Boss. But a Fire Boss that can successfully handle the duties associated with a fire requiring only 6, 10, or 21 men for control probably would not be able to manage the organization, plan the strategy or determine the tactics to be employed on a fire requiring 1,000 men to control.

The qualifications for a Fire Boss vary from the very simple to the very complex. Actually, there are about nine types of Fire Bosses -- those who can plan the strategy, determine the tactics to be employed and establish and manage the organization required on fires involving a fire job load of:

Men Per Shift or Equivalent in Men and Machines

1.	6	Cuell Commercian Char Bine Dear
	6	- Small Suppression Crew Fire Boss
2.	14	- Medium Suppression Crew Fire Boss
3.	21	- Large Crew Fire Boss
4.	63	- Multiple Crew Fire Boss
5.	126	- Two Sector Fire Boss
6.	189	- Three Sector Fire Boss
7.	378	- Two Division Fire Boss
8.	945	- Multiple Division Fire Boss
9.	Fire handled as two	or more fires - Coordinator Rive Ross

In general, the duties of a Fire Boss are quite similar regardless of the fire job load involved. Although similar, they differ widely in degree of difficulty and complexity as the fire job load increases. They are simple and are easy to resolve on fires having a light fire job load but become increasingly complex as the fire job load increases and the fire behavior pattern becomes more difficult to interpret.

The Fire Boss' knowledge of fire behavior, his ability to plan the strategy to apply, and the tactics to employ and leadership ability in the management of men and machines must be greater as the fire job load increases and the behavior of the fire becomes more complex to resolve into plans for control.

Each element in the following job descriptions of the Fire Boss position should be interpreted in accordance with the foregoing general statement when qualifying personnel to serve as Fire Boss on fires of differing degrees of planning difficulty and fire job load.

The Fire Boss has full authority and responsibility for managing a fire control operation within the framework of legal statute and current policy statements.

His primary responsibility is to organize and direct the fire organization toward efficient and complete control of the fire:

Responsibilities during early stages of the fire:

Prior to leaving for the fire, he must obtain the best available information on the location of fire and forces and equipment being sent.

On larger and more complex fires he will usually travel to the fire by a route that will provide a vantage point to size-up the fire and the adjacent country. Where feasible when complex fires are involved he will make this observation from an airplane.

Upon arrival at the fire he will:

Determine probable spread by immediate time periods on small simple fires and probable spread during first burning period on the more complex fires.

Next he will notify the dispatching agency of the adequacy of resources assigned to the fire with an estimate of what the fire may do and what further resources are required for control.

Prepare a plan of control which will insure the most effective and safe use of assigned resources.

Provide positive safe measures to insure proper disposition of resources upon their arrival at the fire.

Organize resources presently working on the fire in keeping with his plan of control.

Actively direct and coordinate the activities of fire suppression for the balance of the shift or until control is effected giving consideration to unsafe and dangerous developments. See that demobilization plans are prepared.

Report changes in conditions unless to do so will interfere with his line supervision duties.

Maintains a communication schedule (by assignment of an individual to this job if personal contact interferes with line supervision).

Prior to crew or sector organization, will assume all the responsibilities of the Crew or Sector Boss.

Organize the line forces into crews, sectors and divisions when required.

Organize needed Service and Plans Units.

Responsibilities of the Fire Boss on the going fire:

Determine strategy and tactical plan for control and issue necessary orders to obtain needed manpower, overhead, equipment and facilitating gear.

Decide on use of off-shift personnel or other available personnel to meet unforeseen or new situations.

Brief Line Boss, Plans Chief and Service Chief where employed. (Crew, Sector and Division Bosses are briefed and interrogated by the Fire Boss on fires where they operate under his immediate direction.)

Conduct strategy meetings when appropriate.

Check on and initiate action to provide for the welfare and safety of all personnel.

Maintain high level of performance.

Take required action on all cases of personnel deficiency.

Anticipate need for and assign work to functional assistants as needed. Prior to their arrival, must perform the duties of all vacant positions in the direct channel of command.

Determine need for Safety Officer.

See that functional assistants when used understand and complete their work thoroughly and within time limits in accordance with plans.

Remain in communication, for emergency consultation except for short periods. Designate an acting Fire Boss with full authority for decision when necessary.

By proper planning and delegation secure sufficient rest. See that subordinates secure all possible rest.

Visit critical and potential problem areas personally.

Determine time when demobilisation should start. On fires with a heavy fire job load this involves demobilization of Plans, Service and Line functions.

Make out performance rating for immediate subordinates.

b. Line Boss (Line Chief)

When a fire organization reaches a stage making it impossible for the Fire Boss to devote sufficient time to the supervision and direction of Sector or Division Bosses a Line Boss is required whose primary responsibility is to see that the line plan of the Fire Boss is carried out. He and his line overhead have but one responsibility; this is to direct field action to control the fire in accordance with the strategic and broad tactical plan of the Fire Boss and to see that the work is accomplished with safety. He is provided with a job assignment which specifies the general location, time of completion and, in general terms, the nature of the work to be accomplished. He is informed of control forces (men, tools, specialized equipment and overhead in organized units) and adequate transportation, communication, and camp facilities available. He has latitude to make decisions within the limits of the plan given him.

He is directly responsible to the Fire Boss.

He:

Organizes field forces on his assigned units of the fire in accordance with the plan of control provided by the Fire Boss.

Adheres to the following units of authority and responsibility and performs the duties as indicated by the following representative list:

Reviews the plan of control pertaining to his area with the Fire Boss making such suggestions as he feels pertinent on the basis of personal knowledge of the fire and requesting such additional information as is necessary to adequate performance of his duties.

Briefs his line overhead for the ensuing shift. Checks each to make sure all points are fully understood. Such instructions to include:

Condition of fire behavior and fuel peculiar to locale. Particular note of blow-up possibilities.

Location of work including alternate plan, and division termini. If there are several divisions location of sector termini should be handled by the Division Bosses. Sequence and timing of operation.

Whereabouts and means for his immediate line overhead to contact him during the shift.

Resources assigned and planned organization of the division - on sectors when serving as Line Boss on fires below the Division Stage.

Will keep currently informed of conditions and progress on divisions or sectors assigned him by personally inspecting the more important ones at least once each shift. Inspection will cover the following points in the Line Boss check list:

Is action being taken in accordance with time limits specified in control plan?

Are proper techniques being employed?

Are resources adequate (number, type and condition) for the assigned job?

Does manpower and specialized equipment complement each other?

Are sectors or divisions properly correlated?

Are plans and services adequate?

Are special problems that will carry over to the next shift located, identified and recorded for

transmission to the Plans group upon request and for review with personnel of the relief shift.

Are Sector Bosses receiving guidance and training from Division Bosses?

Are surplus resources being made available for redistribution or release?

Are inter-sector and inter-division resources (such as plows, and bulldozers) being properly shared?

Are strategic and general action plans being followed?

Coordinates activities of all sectors of divisions in his charge and determines need for immediate redistribution of resources to meet conditions as they develop and, if possible, calls them to the attention of the Fire Boss. If need for redistribution is urgent and communication impossible, makes adjustment and notifies Fire Boss at earliest possible moment.

Determines the disposition of planned reserves, calling into action as needed without further clearance. Should if possible, notify Fire Boss of action.

Will coordinate activities of Sector Boss on the Three Sector fire or Division Bosses on other fires by radio, written message or personal interview to keep them assured as to the correctness of action being taken by them.

Participates in reduction in size of overhead organization when the job requirements permit combining of duties.

Will see that subordinates (Division Boss-Sector Boss-Crew Boss) adequately handle timekeeping responsibilities.

Makes our performance ratings of immediate subordinates when required.

True safety is within our reach and needs only to be practiced to be realized.

Note:

Line Bosses are used when required; but usually never below the Three Sector Stage fire.

c. Division Boss

The Division Boss is usually responsible to the Line Boss. His direct responsibility is the control of a designated division of a fire, including all phases of line work, backfiring, mop-up and patrol. He has full authority and responsibility for directing and supervising all work on his division.

The span of control is 3 to 4 sectors. He should be able to cover the hot or troublesome sections of the fire line or fire edge at a minimum of two times per shift using all available modes of transportation and considerable walking.

This rule may be limited to one trip if critical sections demand his presence and the remainder of the sectors are under reasonable control. He pays special attention to potential blow-up conditions, line of retreat for crews and safety areas.

He should not leave his division unless approved by his superior until he has thoroughly reviewed the conditions, problems and accomplishments with the Division Boss of the next shift.

He:

Organizes field forces on his division of the fire in accordance with the plan of control provided by the Line Boss, in some cases by the Fire Boss.

Adheres to the following units of authority and responsibility and performs the duties as indicated by the following representative list:

Reviews the plan of control pertaining to his area with the Line Boss making such suggestions as he feels pertinent on the basis of personal knowledge of the fire and requesting such additional information as is necessary to adequate performance of his duties.

Briefs his line overhead for the ensuing shift. Checks each to make sure all points are fully understood. Such instructions to include:

Condition of fire behavior and fuel peculiar to locale. Particular note of blow-up possibilities.

Location of work including alternate plans Sector and Division terminis Sequence and timing of operations

Whereabouts and means for his immediate line overhead to contact him during the shift.

Resources assigned and planned organization of the Division and sectors.

Will keep currently informed of conditions and progress on his division and adjacent divisions. Will personally inspect work on "hot" or troublesome sectors twice each shift. Inspection will cover the following points in the Division Boss check list:

Is action being taken in accordance with time limits specified in control plan?

Are proper techniques being employed?

Are resources adequate (number, type and condition) for the assigned job?

Does manpower and specialized equipment complement each other?

Are sectors properly correlated?

Are plans and services adequate?

Are special problems that will carry over to the next shift located, identified and recorded for transmission to the Plans group upon request and for review with personnel of the relief shift.

Are Crew Bosses receiving guidance and training from Sector Bosses?

Are surplus resources made available for redistribution or release?

Are inter-sector resources (such as plows, and bull-dozers) being properly shared?

Are strategic and general action plans being followed?

Coordinates activities of all sectors in his charge and determines need for immediate redistribution of resources to meet conditions as they develop and, if possible, calls them to the attention of the Line Boss. If need for

redistribution is urgent and communication impossible, makes adjustment and notifies Line Boss at earliest possible moment.

Determines the disposition of planned reserves, calling into action as needed without further clearance. Should if possible, notify Line Boss of action.

Will coordinate activities of Sector Bosses on his division by radio, written message or personal interview to keep them assured as to the correctness of action being taken by them.

Participates in reduction in size of overhead organization on his division when the job requirements permit combining of duties.

Will see that subordinates (Sector Boss-Crew Boss) adequately handle timekeeping responsibilities.

Makes out performance ratings of immediate subordinates when required.

True safety is within our reach and needs only to be practiced to be realized.

Note:

Division Bosses are usually used on all fires requiring 3 or more sectors.

d. Sector Boss

Sets in motion and supervises all operations on his sector as outlined by his immediate superior. Attains rate of progress and the quality of performance necessary for suppression of the fire. Determines specifically the time for starting and completing individual operations on his unit. Guides, coaches, and assists Crew Bosses or Equipment Bosses as necessary to secure the quality and quantity of work required. Devotes 95% of his time to fire line activities.

Duties:

Personally leads crews to the job.

Acts as advance Line Locator when possible. Knows Line Locator's duties. Should request and instruct the Line Locator if he hasn't time to do that job himself.

Designates special jobs and assigns sections of line to Crew and Equipment Bosses. Will coordinate activities of hot spot crews, hand and equipment line construction crews, snag felling crews, tanker crews, etc., so that burning-out, holding, mop-up and inspection goes on progressively.

After assignment of personnel, will devote his energies to supervision and training of the Crew Bosses. Will inspect work, train and assist Crew Bosses on unfamiliar activities. Should inspect all of designated unit personally three to four times per shift and take appropriate action as the needs call for it. This rule may be limited to two trips if critical problems demand his full attention and other sections of the sector are under reasonable control.

Contacts adjoining Sector Bosses and agrees on junction points if not designated on the ground by his immediate superior. If the job cannot be accomplished with present resources -- reports to immediate superior.

Keeps immediate superior informed by radio or messenger of progress on his sector as per schedule. Calls attention to surplus or shortage of resources as soon as these become evident.

May change the strategy or general action plan of the sector without immediate approval of his superior when:

Action of the fire forces abandonment of a portion of the line or requires unanticipated action such as control of a break-over or spot fire which cannot be handled as an individual problem.

His immediate superior cannot be reached in time.

Action does not jeopardize the safety of men.

Will remain on his sector until relieved by replacement or by specific instructions of his immediate superior. When being relieved will account for all crews and for all equipment assigned his sector as to location and general condition prior to actual departure from the sector. Will make progress report to immediate superior.

Will see that Crew Bosses record correct time when leaving and arriving at camp. Turns in Crew Boss time to timekeeper.

Will report his own time correctly to immediate superior.

Makes out performance rating for immediate subordinates, if needed.

Will report to superior when jobs of subordinates can be combined to reduce personnel.

Will assign specific jobs and brief Crew Bosses, Cat Bosses, Tanker Bosses, Straw Bosses, etc. In making assignments will:

Describe or point out, where possible, the location of the work.

Define the standard of performance, i.e.:

Width of line or area to be worked. Time to start the operation. Time to complete the operation. This said said said

Define methods, tools and machines to be employed where doubt exists as to ability of Crew Bosses.

a MSICLE STORY

THE MENT

Explain the organization on the sector and the job ahead.

Describe special problems of the unit and define how they shall be handled.

Assist in organization of the crews to accomplish the job.

Tell Crew or special Equipment Bosses about arrangements for service facilities for both men and machines.

Specify arrangements for relief.

Specify safety precautions including line of retreat, safety areas, treatment of injuries by qualified first aid personnel.

Specify location of and use of radio or telephone.

Review off-shift responsibilities of Crew and Equipment Bosses regarding messing, sleeping, first aid, commissary, property accountability, getting men out of camp, equipment operations reports, and time reports.

True safety is within our reach and needs only to be practiced to be realized.

Note:

Sector Bosses not used on fires employing less than the Two Sector organization.

. Crew Boss (Crew Foreman)

The Crew Boss works under the supervision of the Sector Boss on Two Sector or larger fires otherwise the Fire Boss. He is responsible for the performance of his crew, their safety and their welfare for the duration of their assignment to him; hence has responsibility for them both on the line and off the line.

"On-the-line" duties:

Thorough understanding of the work his immediate superior wants done.

Lays out the work for the Straw Bosses.

Sees that Straw Bosses understand what is to be done and methods and tools to be used. Trains them.

Personally directs the work of the Straw Bosses assigned to him.

Takes initiative in controlling spot fires and escapes in his assigned area.

Remains on the line and works with crew until relieved.

Sees that efforts are not wasted on unnecessary work.

Determines escape routes and safety areas at all times.

Prevents "bunching up", "bull sessions" or loafing.

Keeps men distributed along the line.

Acquaints himself with the work of adjoining Crew Bosses.

Observes and enforces smoking rules.

Teaches men to use and care for tools properly. Is held accountable for tools.

Reports misfits, loafers and agitators to his immediate superior.

Reports men to his immediate superior for discharging.

Keeps immediate superior informed as to additional needs for men and equipment.

Sees that first aid and care are given to injured.

Reviews with crew the time being turned in to time-keeper each shift.

Has all tools taken to camp at night and turned in to the service organization unless authorized to do otherwise.

"Off-the-line" duties:

Designates Straw Bosses if not done by immediate superior.

Checks out crew at time of leaving camp and immediately on return after the shift with timekeeper - on Crew Boss Time Report. Turns own time in to immediate superior.

Inspects crew for condition of clothes, shoes, etc., before taking men on the line. Reports conditions.

Sees that crews have first aid and smake bits kits where needed.

Makes written note of any change of assignment involving a change in wage rate and advises timekeeper.

Sees that transportation meets with safety standards before leaving camp. Reports unsafe conditions to superior.

Sees that men left on the line for special details report to Crew Boss rather than to timekeeper. (Timekeeper is instructed not to accept time from individuals without Crew Boss' signature.)

Understands assignments and works with Plow Bosses or other specialists while operating on his section of the line.

Before leaving camp sees that lunches and water have been arranged for.

Obtains information from his immediate superior as to tools needed and inspects tools for condition prior to leaving camp.

Reports accidents and names of witnesses to Sector Boss -- or Fire Boss where no Sector Bosses employed.

Beds crews in units. Is certain that crew is clear of "air-drop" if bedded down during day time. Sees that beds are turned in before leaving camp.

Keeps crew members clear of air drop areas at all times.

Sees that crew is up and breakfasted and on the line at time designated by immediate superior.

Maintains a good spirit among crew members.

True safety is within our reach and needs only to be practiced to be realized.

Note:

Crew Bosses are used on all fires requiring more than 2 Straw Bosses.

f. Straw Boss

Assigned either by Crew or Sector Boss when needed as a working leader of a small group - usually not more than six men. Is responsible for keeping men fully employed on jobs assigned.

Duties:

Understands exactly what the Crew Boss wants done.

Sees that crew has first aid kits, hard-hats, files, etc., before leaving camp.

Sees that men do a reasonable day's work.

Sees that no effort is wasted on unnecessary work.

Keeps men well equipped with proper tools.

Shows men how to use and care for tools.

Helps Crew Boss in off-the-line and camp duties.

Assists the Crew Boss in checking men out and in with the timekeeper.

Keeps a list of names of men and keeps time if requested by Crew Boss.

Looks after the safety of the men on the line.

Reports lazy and incompetent men and agitators to the Crew Boss.

Observes and enforces smoking rules.

Looks after safety of men during transportation.

Sees that the men have lunches and water.

True safety is within our reach and needs only to be practiced to be realized.

No te:

Straw Bosses are used on all fires requiring more than 6 line workers.

g. Advance Line Locator

A Line Locator is needed when fuel, topography and visibility conditions are such that tractor or hand crew line production is held up because of lack of advance fire edge or ground information.

He works under the direct supervision of and is responsible to the Sector Boss for on-the-ground location of the fire line to be built. It is important that the Line Locator be thoroughly familiar with:

Fire behavior and line location techniques.
What can be expected of the various kinds of equipment.
What can be expected of those for whom he is locating.

Specifically, his duties are:

Familiarizing himself with the general plan of control on the sector or sectors to be worked. Notifies Sector Boss when end of sector is reached so Fire Boss, line Boss, or Division Boss can be informed.

Locating and marking route to be followed far enough in advance of operation so that if changes are necessary, they can be made before the crews reach the questionable location.

Selecting tractor-dozer or plow line locations that can be traversed by the machine and will avoid:

Wet or soft ground.
Solid rock or extremely rocky ground.
Heavy snag and down log areas.

Contouring on steep slopes.

Slopes requiring a climb in excess of that which can be negotiated by the unit being used.

Loose boulders on brushy slopes.

Keeping the Sector Boss on whose sector he is working currently informed of the progress he has made -difficulties to be encountered, etc.

General Rules:

Locates line as close to fire edge as possible consistent with burning conditions and strategy outlined by Sector Boss.

Avoids snag patches and heavy down log or slash areas if possible. Keeps these hazards outside of the area to be burned out.

Chooses route to make line construction as easy and rapid as possible, taking advantage of openings, bare areas, barriers, roads, trails, etc.

Avoids as much undercut line as possible and locates line so rolling material will not cross.

Avoids fingered line if possible.

Avoids sharp angles in line.

Locates line a sufficient distance from fire edge so it can be constructed and burned out before main fire reaches it. Takes into consideration fatigue factor of hand crews.

Locates line far enough from burning snags to catch most of sparks and to contain snag if it falls or is felled.

Takes advantage of normal daily shift between up-and-down canyon drafts.

No te:

Use only when needed. This position on Division Stage Fires is usually attached to the Division with assignment by the Division Boss to sectors where the need makes his service necessary.

h. Line Scout

Is responsible to the Officer to whom assigned, either the Fire Boss, Line Boss, Division Boss, or Sector Boss, when conditions are such that the Line Officer or Fire Boss cannot do advance scouting for his unit without detriment to his other responsibilities. Used primarily on the complex project stage fires when heavy timber, smoke or topography limit the gathering of information to arduous foot travel, consequently limiting Plans activities. Obtains full detailed information on location, condition, progress, behavior, and safety within and adjacent to his territorial assignment from or through the Plans Chief and line officer.

Duties:

Secures available information and maps from Plans Chief before going to the fire.

Determines mode of communication and agrees with line officer on communication schedule.

Reviews coordinate system of reporting map locations.

Goes to designated area ahead of control crews, marks route with rags or blazes as necessary. If acquainted with area, may guide crews to area.

Scouts ahead of control crews securing, recording and reporting currently:

Location and behavior of fire edge within assigned area - hot-spots, etc.

Location, size, behavior and potentialities of spot fires.

Fuel types and hazards in and adjacent to fire edge and spot fires.

Possible escape routes and safety areas for crews, if needed.

Possible routes to various parts of fire edge and spot fires.

Water chances enroute.

Areas in which tractors, trenchers, or plows can be used.

Special small equipment needs.

Prevailing winds - slopes.

Upon request of immediate superior:

Acts as Line Locator ahead of crews.

Marks route to spot fires.

Directs small crews to spot fires.

Maintains contact with adjoining units.

Knows Line Locator's job description.

Note:

Use only when needed. This position on Division Stage Fires is usually attached to the Division with assignment to sectors where services are needed.

1. Cat or Plow Boss (Dozer or Plow Foreman)

He is responsible to the Fire Boss on Multiple Crew or smaller fires and to the Sector Boss on all other fires for the efficient use of dozers and plows on the fire. Based on instructions from his Fire Boss or Sector Boss, he will:

Construct the fire line as determined by his administrative superior.

Supervise and correlate the work of the dozers and plows and personnel assigned to his operation.

Provide for the safety and welfare of equipment and personnel assigned to him.

Keep time for all machinery and personnel under his supervision; check it with operators and submit to timekeeper.

Develop an on-the-spot understanding between the dozer (plow) operators and the dozer (plow) crews of the signals to be used in directing the operators. They should include such commands as "stop", "come ahead", "back up", "caution", "cannot see spotter", "turn left", "turn right".

Arrange with immediate superior for relief of operators and other members of his crew or crews.

Make arrangements with Equipment Officer for the proper servicing and maintenance of the machines (fuel, lubrication) with a minimum loss of time.

Inform immediate superior immediately of any breakdowns. Likewise inform him of progress being made and when the job is finished. Avoid long and unnecessary idleness of equipment. (It may be urgently needed elsewhere.)

Be alert to the following good management practices when using dozer equipment:

When working close to the fire avoid carrying fire outside the line. Hot burning logs and stumps should be pushed into the burn away from the line.

Do not allow operator to bury fire or leave "dozer piles" within the burned area. Scatter or remove them as they may hold fire for weeks and cause the eventual loss of the fire.

Take advantage of favorable fuels and topography.

Keep men away from the vicinity of the tractor or plow.

Advise all members of his crews of the hazards of the job and have adequate plans of escape to be used in event of a blow up.

When two or more dozers or plows are used as a unit or worked in tandem, see to it that they work far enough apart for safe operation. Likewise, that they do not become so widely separated that they cannot be communicated with.

Long sustained grades on the fire line should be broken in order to avoid excessive erosion.

Personally supervise loading and unloading of tractors and other heavy machinery when possible.

Will report completion of assigned job to immediate superior.

True safety is within our reach and needs only to be practiced to be realized.

No te:

Use only when needed.

j. Power Saw Boss (Power Saw Foreman)

The Power Saw Boss works under the supervision of the Fire Boss on all fires below the Sector Stage, under the Sector Boss on all other fires and is responsible for the work of the men and equipment assigned to him. This is a highly specialized field requiring the services of a man who is not only familiar with fire control requirements but is well versed in the mechanical operation of power saws and the job of felling timber. The work may consist of partial cutting of logs in front of a tractor, cutting logs for hand or plow line construction, felling snags prior to burning operations or in mop-up operations.

Specifically his duties are:

Familiarizing himself with the basic plan of control on his assigned sector or sectors.

Coordinating the falling operations of his crew or crews with the work of other crews and machines to avoid endangering these facilities and unnecessary delays.

Upon advice from his immediate superior determining the priority of work, selecting snags or snag area most dangerous to control for immediate removal, width of strip to be worked, etc.

Supervising and coordinating the work of the falling crews assigned to him.

Reporting currently to his immediate superior, keeping him informed of progress.

Seeing that arrangements are made for the shifting or release of saw crews no longer needed in the operation.

Knowing the safety requirements necessary and see that saw crews adhere to same.

Keeping correct time reports for fallers' time and power saw operation. Checking time with operators to be sure they are in agreement.

Seeing that arrangements are made for relief or replacement of crews when long shifts are evident.

Arranging for proper care, maintenance and service of saws.

Reporting to immediate superior upon completion of assigned job.

No te:

Use only as needed.

k. Spotter

Works under the immediate supervision of the Cat or Plow Boss and is responsible for following the route ahead of the tractor, laid out by the Line Locator.

If possible, he should be a fully qualified dozer or plow operator and may alternate with the operator. Specifically his duties are:

Works directly in front of the lead plow or dozer a safe distance, follows the general route marked by the Line Locator and signals to the operator the exact course. Uses a flag in daytime and a light at night.

Determines exact location of line from general location by Line Locator.

Warns operator of, or avoids, all hazards as stumps, logs, banks, ditches, mine shafts, snags, loose boulders, rim-rocks, etc.

True safety is within our reach and needs only to be practiced to be realized.

1. Tanker Boss (Tanker Foreman)

The tanker Boss is responsible to the Fire Boss on fires below the sector stage; to the Sector Boss on all other fires for efficient use of tankers or pumpers. This job requires the services of a man who is not only familiar with fire behavior, but also skilled in the correct use of water and hose lays in direct attack on fires and conservative use of water in mopupe. He must also be familiar with the operation and maintenance requirements of various types of pumpers. Based on instructions from his immediate superior he will:

Assign tankers or pumpers to designated locations.

Supervise and correlate the work of the tankers and personnel assigned to his operation. Each tanker

crew foreman should be given specific instructions as to just where and what his assignment is; e.g. hot spotting, working hot line, mop-up, cooling off around snags for fallers, assistance in back firing, etc.

Coordinates work of tanker and hand crews in same area, e.g. tanker crew will work hot line and cool off flames, with hand crew assisting in hose pulling and actual line construction behind tanker crews Hand crew will turn, stir and scrape smoldering material for hose crews in mop-up work.

Inform immediate superior as to approximate location of tankers that can be called upon in emergencies for assistance on slop-overs, spot fires, etc.

Instruct tanker crew foreman to be on alert for spot fires and give immediate attention to them and stand ready to assist adjacent Crew Bosses who might call for help in emergencies.

Advise immediate superior of changes in location of tanker equipment.

Know principles of water use as outlined in pamphlet - "Water vs. Fire."

Work with tanker operator giving any necessary training in proper use of water and see that necessary training is given to the crew.

Give special emphasis in training in use of water to volunteer or pickup crews assigned to tankers and to crews on cooperator tankers.

Inform tanker crew foreman of tanker refill locations, or arrangements for refill by mother tankers.

Make arrangements and issue instructions for correlation of tanker crews for progressive hose lays, up hill water relays, etc.

If necessary, assist tanker crew foreman in developing an understanding between tanker operator and crew on hand signals to be used.

Check with immediate superior on arrangements for relief crews for tankers.

Check with tanker operators to be sure tankers are being properly serviced and whether being operated properly. Check especially when being operated by pickup, coop., or relief crews.

Check with immediate superior (and Service Chief or Equipment Officer) on arrangements for supply and delivery of fuel and lubricating oil.

Check on availability and use of proper equipment, fittings, nozzles, hose, etc., on tankers.

Inform his superior immediately of any tanker break-downs.

Inform immediate superior of progress being made on assignments and completion of assignments.

Provide for safety and welfare of equipment and personnel assigned to him.

Advise all tanker crew foreman of hazards of the job and have adequate plans of escape to be used in the event of a blow up.

Keep and submit time to timekeeper for all equipment and personnel under his supervision.

True safety is within our reach and needs only to be practiced to be realized.

Note:

Not required on all fires.

m. Service Chief

Works under the supervision of the Fire Boss and in close contact with the Plans Chief.

Is responsible for furnishing all facilities and services called for in the plan of control for the fire. Such services and facilities to include Communication, Transportation, Supply and Camp Management in the proper amounts and at the proper time and place. This includes:

Personnel fed, rested and segregated by units for rapid dispatch. Provision for first aid facilities.

Tools sharpened and segregated.

Vehicles serviced and manned by qualified drivers.

Specialized equipment serviced and manned by qualified operators.

Establishes, maintains and operates fire camps; assigns and supervises personnel needed to operate the camps, will ordinarily select camp locations according to plan, but in absence of such a plan, will independently plan the camp locations needed for proper service of line personnel. When independent plan is made, review by Fire Boss or Plans Chief will precede establishment of camps.

Secure men, tools and specialized equipment as requested by the Plans Chief or Fire Boss. Anticipates requirements in general terms. When given a manpower and overhead list, will independently determine rations, bedding, commissary, and transportation requirements and obtain or have such items immediately available. Is responsible for keeping such supplies available and ready for use as called for. Sees that purchase orders are issued for all purchases and that contracts of hire are made for all equipment hired.

Obtains, services, and operates a transportation fleet to transport men, supplies and equipment. The size and character of the fleet is ordinarily determined by the Service Chief from an analysis of the control plan and anticipation of transportation requirements based on:

Transportation routes.

Facilities available.

Type of objects to be transported.

Decides mode of transportation, schedule of trips, routing, etc.

Establishes, maintains and operates a communication system in accordance with a Communication Plan developed by the Plans Unit that will provide continuous service for:

The Plans Unit and its field personnel.

The line organization.

Service Chief and his outposts.

Fire headquarters and the behind-the-lines agency.

Special needs such as planes, tractors, etc.,

as determined by the Fire Boss and stated in the plan of control.

Will anticipate normal Service needs on the basis of the organization, personnel, and location of probable control line. Refinements will be based on approved control plans.

In addition to the stated requirements of manpower, tool, equipment and facilities, independently calculated the anticipated attritional losses of the particular fire and requisitions and distributes the items needed to maintain the quantity of control resources at the proper level.

Upon receipt of the planned line organization, organizes and dispatches crews and equipment in accordance with instructions. Is responsible for the line forces until delivered to the place and/or person called for in the instructions.

Specifically, he:

Determines the personnel and organization requirements of the Service Unit. Gives special consideration to reduction of subordinates when job requirements are being reduced.

Determines time required for mobilization of resources.

Determines time required for distribution of control resources from base to key points on line and adjusts camp routine to absorb this time element.

Determines source, quantity and type of unobligated control resources available for assignment to the operation and keeps this information currently summarized and Plans notified.

Maintains contact with secondary camps (line camps) and sees that they efficiently and completely serve line forces.

Determines through consultation with Headquarters Dispatching Unit and the Fire Boss a priority of release for manpower and equipment. As surpluses become evident, organizes and dispatches to their destination.

Determines replacement needs of men, overhead, equipment and supplies and takes necessary steps to have available as needed in accordance with Plans of the Plans Unit.

For each basic item requested (groups of men, equipment, mules, etc.) determines and obtains the supplementary items necessary to make the item a sustained operating unit.

Supervises the work of the Equipment Boss, Supply Officer, Communication Officer or Camp Boss. In their absence or prior to their arrival, must perform the duties of the position.

Sees that accepted safety practices in camp set-ups and transportation facilities are followed.

Sees that adequate first aid facilities are available in camps and on the line.

Assists Plans Chief in the development of the demobilization plan and executes the Service Sections of such plan. This plan includes safe transportation of personnel and equipment to their home bases.

Outlines and supervises the timekeeping job. Sees that timekeepers maintain time records of all personnel and special equipment. Sees that the pertinent parts of this information is provided the Plans Unit.

Note: Service Chief's are usually employed on all fires above the Two Sector stage.

. Equipment Officer (Equipment Boss)

The Equipment Officer is responsible to the Service Chief for the overall coordination and management of machines and livestock assigned to the fire. This will normally include personnel and supply-carrying vehicles, heavy transports, tractors, power saws, tankers, and pack stock. Depending upon the total job load involved he may have assistants directing, but responsible to him in directing one or all of the following services; tractors, ground transportation, pack stock, saws or tankers. On fires requiring a Two Division Stage or larger Organization a transportation officer usually is essential if large numbers of privately owned transportation equipment is being used.

Specific duties are:

Determine need for special assistance if any required such as transportation officers, service units (mechanics, lubers, etc.), relief tractor operators, packers, machine expediters, etc., and take action through the Service Chief to secure them.

On the basis of items requested to be transported within specific time limits, determine the type and amount of transportation equipment needed, and see to it that all of it gets to the right place at the right time, and in good working order.

Determine the number of personnel, drivers, mechanics, packers, etc., needed for operation and maintenance of machines and pack stock.

Organize and supervise subordinate personnel.

Maintain current summary of machines showing type and location, and make this information currently available to the Plans Unit.

Arrange for the service and maintenance of all machines and livestock, including bulldozers, power saws, tank trucks, trucks, horses, etc. See that all equipment is covered by contract.

Determine the supplies (gasoline, oil, repair parts, forage, saddles, lubrication units) needed to maintain the machines and pack stock in safe and efficient operating condition and see to it that they are available on the job. Arrange with Supply Officer for most expeditious ordering.

Select and post, where necessary, the best and safest transportation route to key points on the fire (will check scouting information to determine how much independent work is necessary.)

Establish traffic controls to prevent congestion or accidents.

Prepare traffic schedules which will permit most economical use of transportation equipment.

Turn in time of packers, truck drivers, mechanics, etc., working under him, to timekeeper and check classification to be sure they are correct.

o. Supply Officer (Supply Boss)

Is responsible to the Service Chief for obtaining and distributing all items called for in the plan for control of the fire and with the exception of those duties assigned to the Camp Boss, the Equipment Officer and the Communication Officer, of maintaining them in working condition. Works closely with Dispatcher.

Specific duties are:

Keeps current summary of the location of all items other than personnel and heavy equipment, assigned to the fire. Works in close contact with the Maps and Records Officer. Checks all orders for completeness; determines need for supplementary items. Maintains adequate stock of essential foods and other items.

Places all orders with supplying agency and/or procures locally in accordance with established procedures. Sees that purchase orders are issued for all purchases made by him.

Establishes time limits and schedules for placing of orders for the various classes of items used and notifies persons responsible for originating orders.

Determines availability of items that may be needed in control of the fire.

Maintains tools and small equipment and assembles by logical line unit for issue each shift. Establishes and maintains a system of accountability.

Determines commissary (tobacco, socks, etc.) needs, procures and arranges for issuance by the timekeeper.

Determines the replacement rate for all items except communication and transportation, and after approval of Service Chief, secures such replacement.

Organizes and supervises subordinate personnel.

Obtains adequate supply of safety equipment, such as stretchers, hard hats, first aid kits, truck seats, tool guards, etc.

Note: Supply Officer used on Two Division and higher stage fire organizations only.

p. Communication Officer

The Communication Officer is responsible to the Service Chief for establishing, maintaining and operating the communication facilities.

Duties:

Determine equipment (type and amount) required to meet communication requirements established by the Plans Unit for the job. Arrange with Supply Officer for most expeditious ordering.

Determine personnel needs - technicians, operators, messengers, and guides.

Determine repair and replacement needs (crystals, tubes, telephone line, batteries, etc.) arrange with Supply Officer for most expeditious ordering.

Install, maintain and operate, communication facilities in accordance with Communication Plan proposed by the Plans Unit.

Prepare schedules to meet requirements of the control plan within the limit of available resources.

Maintain record (map and chart) of location of equipment.

Independently work out and suggest improvements to communication system.

Organize, train and supervise subordinate personnel.

Review communication and safety needs with Line Staff Officers.

Establish message center at base camp through which all messages are sent, received, and recorded.

q. Camp Boss

Is responsible to the Service Chief when one is employed, or to the Fire Boss when not employed, for the establishment and operation of a base of operation. Is furnished with the location, general requirement and time schedule of the particular base.

Camp Bosses of Line Camps are directly responsible to the Division or Sector Boss depending on whether a Division or Sector Line Camp.

Specific duties are:

Plans the detailed layout and sets up the base.

Organizes and supervises subordinate personnel.

Specifically designates and makes assignments to sleeping areas. Sleeping areas to provide for proper segregation of personnel, safety, quiet, and maximum amount of shade for day sleepers. Special consideration should be given to safety in selecting day bedding grounds in air drop camps. All bedding grounds should be roped off or isolated to eliminate any possible danger from tractors and trucks.

Sees that men are provided with proper sanitary facilities within the limits of available resources.

Provides for a safe water supply.

Organizes and schedules the feeding of personnel (including lunches) to meet the requirements of the control plan.

Establishes warming fires, bulletin board and similar facilities as needed.

Establishes and operates a first aid station for treatment of minor injuries. Arranges for treatment of more serious cases by a regular physician preparing necessary forms, etc.

Prepares instructions for Crew Bosses governing their camp responsibilities, time schedules and camp routine while in camp.

Determines supply and personnel requirements for the camp management unit.

Organizes and mobilizes personnel for assignment in accordance with the plans for the shift. Actual dispatch of crews will be done by Service Chief when one is employed.

Reports time of camp help to timekeeper and checks to be sure they are properly classified.

Is responsible for clearing and keeping aerial drop area clear of personnel while dropping is being done.

Handles routine Service work up to and including the Two Sector stage fire.

Note: Camp Boss used on all fires of Multiple Crew or higher fire organizations.

c. Air Officer (Air Operations Boss)

Where one or more aircraft are used on a fire, a qualified employee shall be designated as Air Officer. He is responsible to the Service Chief or Camp Boss if no Service Chief is employed and is in charge of planning, establishing and maintaining the performance standards of the aerial phases of the specific operation in conformity with pertinent regulations and instructions in the U.S.F.S. Air Operations Handbook.In a complete aerial operation assignment of assistants may prove necessary.

His duties include:

Helps plan daily use of aircraft.

Coordinates all cargo dropping, reconnaissance and transportation of personnel.

Assigns ships and personnel.

Schedules all flights and flight missions.

Establishes priorities.

Briefs personnel each day on:

Type of missions to be flown.

Landing points to be used.

Schedule to be maintained.

Weather and smoke conditions.

Hazards such as power lines.

Safety.

Maintains necessary records.

Advises local airports that private aircraft should stay out of hazardous zones during air operations.

Constructs and maintains heliport:

Adequate clearance for approach, landing and take-off.

Install streamer to indicate wind.

Wet down landing spot if necessary.

Service:

Checks with operators on supplies available for operation.

Consults with Supply Officer for most expeditious ordering plan.

Safety:

Ensures full compliance with good safety practices and regulations by thorough investigation and prompt corrective action of any unsatisfactory operational component.

Helicopters:

Keep unauthorized personnel away from heliport.

Train personnel to approach, enter and leave ship properly.

Equip helpers with goggles.

Check on proper loading and unloading of personnel and cargo.

Ground ship during periods of high wind and poor visibility.

Fixed Wing:

Provide cargo dropper with chute and knife.

No loose chutes in plane.

Static line on all cargo.

Safety strap across door of plane if needed.

Cargo packed properly.

Notifies Camp Bosses when drop will be made in order for drop area to be marked and cleared of personnel.

Note: Employ only as needed.

s. Cargo Boss (Cargo Officer)

This position is usually established at the discretion of the Air Officer when the proposed aerial deliveries require a ground crew of three or more men.

The individual filling this position must have knowledge obtained through training and experience to accomplish the following:

Pack cargo parachutes.

Pack supplies and equipment for paracargo or aerial freight units consistent with types of aircraft being used.

Load and unload aircraft (under direction of pilot).

Attach appropriate cargo parachute to the classes and sizes of the selected packaged items.

Ground transportation of supplies and equipment.

Receive and check supplies and equipment as they are delivered to the operating base.

Keep adequate records and reports required.

Supervise and train the men necessary to assist him in accomplishing a successful job.

Safety of personnel.

Note: Employ only as needed.

t. Plans Chief (Plans Boss or Operations Officer)

Works under the supervision of the Fire Boss and in close contact with the Service Chief.

Is responsible for:

Collecting and compiling all data concerning the fire, calculating probabilities and control force requirements.

Collecting and compiling data on resources assigned to the fire.

Preparing individual written instructions of Fire Boss for line personnel to Sector Boss level.

Maintaining all records for the fire, both management and administrative. Such records to include the log of the fire, time records, data for preparation of 929, 10 o'clock report, special narrative report, summary of personnel and special equipment, and accident record.

Assignment of personnel, equipment and tools to line units as specified by the Fire Boss or on his own initiative where instructions are lacking.

Specific duties of the position are to:

Obtain and compile in usable form the following data concerning the fire area and report to Fire Boss.

Location of fire perimeter.

Behavior of fire on all parts.

Topography.

Soil formation and conditions.

Cover (types and density).

Weather conditions, current and forecasted.

Access routes and rate and mode of travel.

Status of control.

Possible camp sites.

Calculate probabilities of the fire including blow-up potentialities and make report to Fire Boss.

Calculate control force requirements and determine type of action most applicable within the limits of available resources. Make report to Fire Boss.

Prepare a statement of communication requirements for the Line and Planning Units indicating frequency of contact and priority of installation and submit report to Service Boss.

Maintain records of manpower, overhead and special equipment showing:

Number.

Qualifications.

Identification.

Location (on-shift, off-shift and where located).

Time in a work status.

Prepare written instructions to line personnel on basis of Fire Boss decisions and instructions. Instructions to include:

Section of line assigned to each unit.

Time allowed for completion of control.

General action plan.

Pertinent information concerning adjacent divisions.

Alternate plan of control and steps required to place in effect.

Location of camps, radios and other service facilities.

Map of fire or at least of assigned unit of fire.

Special explanation as needed for understanding of assignment.

Accident control.

Assist Fire Boss in briefing and interrogation of line personnel.

Plan personnel needs of the Plans Unit. Organize them and supervise their work. Prepare written instructions for these men as necessary.

Prepares demobilization plan for Fire Boss.

Be alert to reduction in volume of work of subordinates and to combine jobs to reduce overhead.

Submit completed fire records and data to agency responsible for fire.

True safety is within our reach and needs only to be practiced to be realized.

Note:

Plans Chief employed on Multiple Division and higher stage fire organizations only.

u. Information Officer (Intelligence Officer - Scouting Boss)

Is responsible to the Plans Chief or Fire Boss when no Plans Chief is employed, for gathering all information to cover all points in the General Scout job description plus any specific information requested by the Plans Chief or Fire Boss. Information to be in the form needed for intelligent analysis and within time limits established for the particular fire. Will determine the requirements of his organization including personnel, facilities, and service and provide the necessary supervision and guidance to insure adequate performance.

Representative Duties:

Establishes and designates key points on line and signs access routes into such points. Prepares map showing these data.

Determines method of safe scouting (foot, horse, plane, car).

Places order for needed transportation for himself and subordinates through the Service Unit.

Determines size of general scouting job and divides fire area into scouting units.

Assigns personnel to complete job in time allotted.

Prepares and issues instructions to General Scouts.

Area assigned.

Data to obtain (See General Scout job description).

Method for recording.

Time and method of communicating data.

Secures and assigns necessary facilities for doing general scouting job (compass, abney, rule, protractor, map sheets, photos.)

Receives all General Scout reports direct. Records data on master scout record. Such record to show location, character, time of observation and magnitude of findings. Will include current accomplishments and anticipated accomplishments by end of current shift. (Progress Map.)

On controlled lines, prepares map of line showing location of special hazards.

Prepares map of areas needing special spot fire attention.

Scouts personally where time and size of job permits and in any event sufficiently to permit intelligent analysis of scout reports.

Makes contact with line personnel and secures their opinion on:

Manpower requirements next shift.

Tools and special equipment next shift.

Problems needing special attention.

Best point for distribution of next shift and point for pickup of present shift.

Locates possible camp sites and prepares map of access route.

Locates and maps unburned islands.

Secures data on line construction rates.

Prepares map of fire by 12-hour periods.

Secures data on values, houses, fences, etc., that may affect control plan.

Prepares photo maps of fire area showing perimeter and other pertinent information such as roads, streams, ridges, spot fires.

Secures aerial photographs of fire edge and terrain ahead of fire.

Safety is within our reach and needs only to be practiced to be realized.

Note: Information Officers employed on Three Sector and higher stage fire organizations only.

v. General Scout

Is responsible to the Information Officer (or Fire Boss, if no Information Officer). Used primarily for aerial scouting alternating with Information Officer. Does ground scouting when planes or helicopter unavailable, or when heavy timber, smoke, fog or topography make aerial scouting unsatisfactory. Person assigned to general scouting job should be whenever possible a local forest officer or a native trained in scouting and familiar with the area.

Duties:

Receives assignment and reviews plan with immediate superior.

Takes flight over fire area, if possible, before scouting on the ground.

Studies aerial photos, topographic maps and administrative maps before going to fire. Secures data from aerial photo interpreters when employed.

Gets as much information as possible regarding area to be scouted from local residents, local forest officers, Line Scouts and line men already on the fire. Determines mode of communication and agrees with immediate superior on communication schedule.

Agrees with immediate superior on coordinate system of reporting map locations.

Uses horse or pickup for transportation whenever possible and covers balance of area on foot.

Scouts ahead of control crews securing, recording, mapping and reporting as scheduled to his immediate superior:

Location and behavior of fire edge, hot spots, etc., whether smoldering, creeping, running or crowning.

Location, size, behavior, and potentialities of spot fires.

Fuel types, understory or ground fuels, and hazards such as snag areas, slash areas, etc., in, adjacent to and ahead of main fire and spot fires.

Any improvements such as building, power and telephone lines, bridges, etc., threatened or destroyed by the fire.

Weather conditions encountered on ridges, slopes, canyon bottoms, etc., such as wind, temperature, humidity and moisture condition of fuels whether wet, damp, dry, etc.

Indicate whether streams can be crossed on foot or by tractor.

Location of any features not shown on maps, such as trails, roads, streams, springs, etc.

Location of possible camp sites, aerial drop areas, helicopter landing spots, etc.

Location of ridges or other likely control lines, showing steepness of slope, cover, soil condition, etc., indicating whether there are any barriers to tractors such as rocks, steep areas, etc.

Location of streams, canyons, ravines, etc., possible for control lines. Indicate if canyons are too narrow and steep to be used for control lines.

Indicate any special equipment needs.

Possible routes to various parts of fire edge or spot fires.

Possible escape routes or safety areas for crews, if needed.

Report location of crews or "cats" encountered, progress of line construction, held line, controlled line, etc.

Report immediately:

Any condition needing immediate attention such as fire endangering a crew, buildings, bridges, power or communication lines or threatening to cut off routes of travel or trap travelers on highways, roads, etc.

Any threat or condition which might be remedied through immediate attention and prevent excessive work later such as spot fires away ahead of main burn, a hot spot threatening to cross a road or get into a snag area, slash area, etc.

In extremely rough or hazardous country, scouts should work in pairs.

Note: Employed only as needed. When Plans Chief is employed he is responsible to him, otherwise the Fire Boss.

w. Maps and Records Officer

Is responsible to the Information Officer or Fire Boss depending on the type of organization employed. Performs clerical duties in connection with preparation of administrative records involving control of the fire. Compiles all data on resources available for control of the fire.

Should use to the fullest extent possible the records of others but will initiate such action as is necessary to secure a complete file.

Specific duties are:

On fires where no Service Unit is in operation sees that all incoming and outgoing personnel and specialized equipment are registered by the timekeeper. Report information to immediate superior.

Acquaints all personnel as they arrive in camp, of camp routines (reference to bulletin board) and layout of camp.

Prepares all written instructions on the basis of rough draft or verbal instructions of immediate superior.

Prepares shift organization map showing disposition of resources. Cross-references to job instructions and organization charts.

Collects and summarizes records of Communication, Equipment and Supply Officers immediately prior to each planning session.

Currently prepares a chronology of fire action appending copies of maps prepared by the Information Officer showing perimeter of fire and status of control by 12-hour periods.

Prepares a "Summary of the Situation" similar to 10 o'clock report each 12-hour period. This should show correlation between planned and actual accomplishment.

Assembles all regular administrative reports concerning the fires.

Determines personnel and equipment needs for the records unit.

Organizes and supervises subordinate personnel.

Posts map of fire on bulletin board and shows daily progress.

Posts fire organization charts on bulletin board.

Assists immediate superior in preparing final fire report.

Note: Usually employed on Two Sector and higher stage fire organizations only.

Aerial Photo Interpreter

Is skilled in aerial photo interpretation and puts aerial photos to their fullest use in fire control activities. Responsible to the Information Officer and works with the Fire Boss, Plans Chief, and assists General Scout and Records Officer in obtaining information from air-photos, which they might overlook or be unable to interpret themselves. May also perform duties of the General Scout, if qualified.

Duties:

Sees that adequate aerial photos are obtained to cover fire area and area which probably will be burned, based on predictions of Fire Boss or Plans Chief. If not enough sets of aerial photos available, makes recommendation to immediate superior on number of sets needed and where available.

Obtains as much information as possible from aerial photos to eliminate the necessity of much ground scouting. Obtains, records, and maps such information as:

Cover type, fuel density and hazards such as smag and slash areas.

Improvements threatened, or in the path of the fire, such as buildings, power and telephone lines and bridges.

Location of natural barriers such as, rock slides, streams and bare areas which might be used as control lines.

Location of ridges or other likely control lines, showing steepness of slope, cover, soil conditions, indicating whether there are barriers to tractors such as steep slopes and rocks.

Location of canyons and ravines possible for control lines or indicate if canyons or ravines are too steep or narrow to be used for control lines.

Location of features not shown on available maps, such as trails, roads, streams, springs, reservoirs.

Location of possible camp sites, aerial drop areas, helicopter landing spots.

Easiest possible routes or safety areas for crews.

Location of secondary control line and backfire lines.

In absence of General Scout accurately plots location of fire edge, spot fires and unburned islands from the air. If planes are not available, scouts and plots from the ground.

Assists Records Officer in preparing simple maps from aerial photos for use on the fire.

Aids in briefing line personnel on cross country routes to their part of the line, especially when existing maps are in error. After fire is over, may be able to assist in making damage appraisal estimates, such as burned area - burned timber, brush, grass and woodland.

Note: Employ only as urgently needed.

y. Fire Safety Officer

A Safety Officer is usually employed on all Multiple Division and fires requiring a large fire organization. The need for a Safety Officer on less complex fires will depend upon the experience of personnel used and hazardous conditions involved such as rough terrain, snag area, etc. Ordinarily, the Fire Safety Officer should be a responsible forest officer from the home forest, appointed by the Forest Supervisor of the Forest on which the fire occurs. He will be responsible directly to the Fire Boss. He must have fire experience and a thorough knowledge of fire safety hazards and how they are removed.

The Safety Officer shall keep the Fire Boss currently informed of any action needed to prevent accidents. He is essentially a safety inspector and investigator. He is expected to give safety advice to everybody in the fire organization. The Safety Officer should at all times appreciate the Fire Boss' responsibility with respect to the suppression of the fire and as a Safety Officer he should direct the safety work in such a manner that his actions contribute rather than slow down suppression action.

Some of his most important duties are:

Surveys major hazards in connection with fire line, fire camp, transportation of men, and other fire activities and makes recommendations on how to remove or reduce the hazards.

Checks and reports on availability of facilities to handle minor injuries, and arrangements to take care of serious cases (doctors, ambulances, hospital rescue services, Red Cross Disaster units).

Checks and reports on compliance with Forest Service Safety Code, and use of preventive equipment such as safety guards and hard hats.

Checks and reports on laborers physically unfit for their jobs.

Checks and reports on welfare, sanitation, and safe drinking water conditions. Checks on kitchen personnel, conditions, food, etc.

Checks accident reports and investigates and reports upon serious cases.

Arranges for emergency first aid as necessary.

On fires of several days' duration maintains safety bulletin board and distributes safety materials.

Provides safety advice in strategy planning.

Organizes when possible and aids and advises with overhead in on-the-ground safety training.

This position does not relieve the Service Chief or Camp Boss of the responsibility for having adequate first aid facilities in camps and on the line, operating first aid stations for treatment of minor injuries, arranging for treatment of more serious cases by regular physician, preparing necessary forms, etc. Neither does the position undercut or affect in any way the safety authority and responsibility of any line officer. Such line officers should freely confer with the Safety Officer on special problems that might arise.

One important function of the Safety Officer, as well as all Forest Officers, is to foster the right attitudes about fire fighting. Fires can be dangerous and Forest Officers must respect the aggravated hazards in fire control. The Fire Safety Officer as well as other overhead can instill confidence in fire fighters by letting them know that their welfare is the first consideration when laying out the attack plan for the fire operation.

Safety is within our reach and needs only to be practiced to be realized.

Note: Usually employed on Multiple Division and fires requiring a large fire organization.

FIRE CONTROL HANDBOOK
REGION 6

PART III

SUPPRESSION

CHAPTER 2
USE OF WATER

PART III - SUPPRESSION - Chapter 2

USE OF WATER

Table of Contents

														* -1		Page No.
Introduction		• •	٠	·•	•		٠			¥	•	c#		٠	٠	III-2-1
Effects of Water on Fire			,	ĸ			٠							200	٠	III-2-1
Application of Water			*	•	•			•	•	* * *	* * * * * * * * * * * * * * * * * * * *	•		• • • •		III-2-1 III-2-1 III-2-2 III-2-2 III-2-4 III-2-5 III-2-6 III-2-6
Equipment Operation and Care . Portable Power Pumpers.			*	*			*			*	•			•		III-2-7 III-2-7
Two-cycle Pumpers Four-cycle Pumpers General Instructions .			•	•	•	. /	y i k			•		w.		16	•.	III-2-7 III-2-8 III-2-8
Tank Trucks and Slip-on U	Inita	5 .						*	150	8-		٠				III-2-9 III-2-9
Rolling and Laying Hos	e.		*:	%	».		•	19		,			*	4	-	III-2-10 III-2-11
Adapters (bushings, re Check and Relief Valve	s.		٠.	i jir	*				×	•;					٠	III-2-11 III-2-11
Siamese Valves Take-off Connections .		· ·		٠	*		•			٠						III-2-12 III-2-12
Suction Hose and Strai Nozzles			٠												•	III-2-12 III-2-12 III-2-13
Safety Precautions																
Reference Tables							ā	4								TTT_2_1/

USE OF WATER

Introduction

Where water is available in the vicinity of a fire, it can be a valuable aid in control and will often save time and labor in mop-up; but, there must be a proper balance between use of water and other methods. The officer in charge must decide to what extent use of water is feasible and desirable, and what methods of delivery will accomplish best results. Once a decision to use water has been made and the most practicable means of delivery has been determined, it is important to see that proper technic is used in application.

Effects of Water on Fire

By applying water to the base of a fire, it can be retarded, as this action momentarily cuts off air or smothers the fire. The same action has a cooling effect as water absorbs heat. If enough water is applied for a long enough time, the fire is extinguished because the temperature is reduced below the point where fuel can burn.

Fuels can be insulated with water so they will not ignite readily. For example, a punky snag or log can be drenched to prevent sparks from igniting it, or light fuels back of a fire trench can be soaked and the control line thus widened. Often a spray, or fog, can be employed more effectively than a straight stream for insulating purposes, as a greater surface can be covered in a given time. Fog raises the relative humidity of air, tending to insulate fuels against spread of fire.

Fuels can also be removed with water. With sufficient pressure on a solid stream or concentrated spray, light surface litter can be swept away or duff sluiced out to make a trench to mineral soil.

Application of Water

The principal ways in which water is applied to a fire are with back-pack pumps and through nozzles attached to hose lines, supplied from portable power pumpers, tank trucks, or gravity systems.

Backpack Pumps

The hand pump, attached to a backpack can, a rubber insert bag, or other type of water bag, is used mostly in mop-up. But if water is available very near the fire, or a truck carrying filled backpack outfits can be driven to the fire, these units may be very effective in initial attack and control.

On reaching a fire, the smokechaser or crew may find that a snag has been ignited and is throwing sparks. It may be possible to put out the fire with a backpack pump, thus saving time and labor involved in felling the snag. Backpack pumps may also be used to cool down hot spots or, in conjunction with hand tools, to attack directly and stop the head of a fire.

R-6 F.C. Hdbk. Added 4-28-49 No. 51 In mop-up, backpack pumps are most useful for extinguishing fire that is hard to get at—in stumps or short snags, roots, and logs, and in crevices between rocks, or in deep duff or crumbled rotten logs.

Whether to use a variable spray, or a twin-spray nozzle, or a solid stream nozzle, depends on the particular job to be done. In many cases, a solid stream is necessary to reach the fire, as in stump roots, inside logs, and in snags. With a solid stream, the nozzle should be held as close to the fire as practicable to take advantage of the force of stream and avoid wasting water. A spray may be more effective for wetting down fuels to keep them from igniting and for putting out fire in light fuels or on the surface of logs, stumps, etc. Where fire in a root or hollow log is not too far away, it may be easier to reach all of it with a spray than with a solid stream. In controlling the fire edge in light fuels, a fan spray, made by holding the thumb over the nozzle, is effective and economical of water.

In working the pump, the forward hand is used for guiding, while the hand behind is used for pumping. If the forward hand is pulled toward the back hand, it is difficult or impossible to place stream accurately.

The maximum amount of fire can be extinguished with a backpack can of water by using hand tools in conjunction with it. After spraying water on a log, scrape off the coals and mix with wet dirt. Roll burning logs out of hot beds, to get at fire underneath, and stir coals and ashes after wetting down. Dig out burning duff, so water can reach the fire. A good mop-up combination is one man with a backpack pump and another with a shovel, or other tool as needed.

Hose Lines

The source of supply for hose lines may be a tank truck, a portable pumper, or a gravity system. Where supply is plentiful, amounts delivered to nozzles will be limited by power available, hose friction, and head; and more often than not, it will be less than is needed for the job. It is, therefore, important to use the proper technic in applying water to the fire.

Control: Whether or not to use water in initial attack and control depends on such factors as availability of equipment and manpower, accessibility, fuel types and other conditions affecting spread, and how long it will take to get equipment into operation. It takes time and manpower to lay hose. Fires have been lost because men were used to put a portable pumper and hose lines into operation when the fire could have been prevented from running up a slope or getting into snags if all available men had attacked it with hand tools.

Tank trucks or slip-on units are valuable for initial attack and control. Their primary purpose is to get to fires with water while they are small, but tankers can be used to advantage on accessible sectors of larger fires.

It usually is not practicable to establish a portable pumper system for control, particularly if long hose lines have to be laid, but there may be situations where this is the thing to do, particularly if water and manpower are plentiful. Very seldom will a gravity system be practicable for control, but occasionally conditions may warrant use of this method.

The principal methods and points to keep in mind in controlling fire with any hose system are as follows:

- 1. Instead of digging a trench with hand tools, sluice out with water a narrow strip (2 or 3 feet) at the fire edge, or set a burning-out or backfire and, after it has gotten a good start, water out the outer edge.
- 2. In heavy duff, use a solid stream nozzle, holding it near the ground to get full force of the water. Move the nozzle up and down and sideways for tearing effect. Heavy duff must be torn to pieces by forcing water underneath. Sprinkling on top does little good. In light fuels, spray or fog may be better than solid stream.
- 3. In working on the fire edge, direct stream toward the fire, so as not to throw burning material the wrong way. Usually the stream will be most effective if directed to fire edge at an angle of about 30 degrees. If practicable, start on upper side, so waste water will run down into the fire.
- 4. Do not wet down a wide strip inside control line. Hold the edge and let inside burn out. It may be advisable to wet down a strip behind the line or to insulate heavier fuels with water to prevent sparks from taking hold.
- 5. Work directly on hot spots near fire edge and places where there is danger of fire going into snags or mossy trees. Direct stream or spray at base of the flames. Do not sprinkle. Get as close as possible.
- 6. In working on hot spots and along fire edge, do not work too long in one place. Work back and forth, so as to knock down the fire and control the edge as fast as possible.
- 7. Extinguish fire in snags if low enough to reach. If nozzle pressure is high, a large stream will carry farther than a smaller one. To reach fire high in snag, it may be necessary to concentrate available pressure in one hose line and use a large caliber nozzle, rather than distribute water to several hose lines. Cool off area at base of snag, then work from top down to take advantage of waste water.
- 8. Where a tanker is used and the tank supply cannot be quickly replenished, use small caliber nozzles and have men working with digging tools to get greatest value from a tankful of water.
- 9. Even if the water supply is plentiful, use men with digging tools to speed up control and hold the line.

Mop-up: Aside from initial attack with tank trucks so located as to reach fires quickly, the primary use of water is for mop-up. Decisions regarding mop-up with tankers, portable pumpers or gravity systems should be made on the following basis:

- l. If fuels are heavy and there is danger of fire getting away, particularly if the fire is spotted and there is danger of reburns which may carry fire over control lines, quick mop-up to the point of safety is imperative. Where use of water will save time, this should be done even though other methods would be cheaper.
- 2. If mop-up can be done with water more economically than by other methods, it should be used.

In mopping up with water, attention should be given to the following:

- 1. So far as practicable with safety, permit materials inside control lines to burn down before starting use of water.
- 2. One or more men with shovels and pulaskis should work with each nozzleman, to dig out pockets, break rotten logs apart, turn deep duff, separate fuels, roll logs out of hot beds, etc.
- 3. Burning snags should be drenched on all sides, starting at the highest fire and working down.
- 4. Do not attempt to put out heavy fuels, such as stumps, snags and logs, with one soaking. Time and water will be saved by soaking one spot, then moving to another and returning after work has been done with hand tools.
- 5. Nozzlemen should work as close to the fire as practicable, to conserve water and take advantage of force of the stream. Nozzlemen will get wet if they do the job right.
- 6. Where pressure will permit, use siamese valves or take-off connections and operate several small nozzles from one power source, rather than one or two larger nozzles. Remember that the effective volume from any one nozzle is usually less than 10 gallons per minute.
- 7. Lay extra hose ahead, with extra nozzle, so locations can be changed without delay. Install a siamese near end of line, so additional hose can be connected without interfering with main line.
- 8. Use backpack pumps to extinguish small isolated spots when this is quicker and easier than shifting hose.
- 9. Use spray, or fog, nozzles where they are more effective than solid-stream nozzles.

10. Where a tanker is used and cannot pump directly from an outside source, conservation of water is important. All tankers are provided with shut-off nozzles, which should be closed except when water is being used effectively. Where adjustable nozzles are available, there will usually be an advantage in changing from solid stream to spray, and vice versa, for different parts of the work.

Organization: When a hose system is employed in control or mop-up, the operation breaks down into two main jobs: Getting water to nozzles, and use of the water on control line or in area being mopped up. The second job is the responsibility of line overhead; the first should be organized separately with the objective of supplying water when and where the line overhead needs it.

Every portable pumper should have a trained operator, and, where several pumpers are in use there should be a man in general charge of the group. If number of pumpers on the job warrants it, there should also be a mechanic to make such repairs as can be made in the field.

There should be plenty of men to lay and shift hose, put in sumps for relay, move pumps and protect hose lines. Men should be assigned as needed to pull hose behind nozzlemen.

A foreman should be in general charge of each hose system to coordinate all parts of the operation from water sources to nozzles.

Organization for a tank truck is different from that for a portable pumper outfit. Every tanker will have a trained operator, and the $l\frac{1}{2}$ -ton size, at least, will have a crew of three to five men in addition to the operator. It is desirable that all members of a tanker crew become familiar with operation of the equipment and that practice runs be made, so that, when the tanker is needed for quick control of a fire, there will be no delays in running out hose and getting water on the fire effectively.

Every tanker carries hand tools and the tanker crew should be trained in their use.

Where a tanker can pump directly on a fire from an outside source, the organization is not much different than where a portable pumper is used to supply hose lines.

Relaying Water: When a fire is too high above a water source to reach with hose line from a pump set up at source, it then becomes necessary to put in a relay system, with two or more pumpers. The first pumper picks up water at source of supply and delivers it to a sump, where it is picked up by the second pumper and relayed to the fire or to a second sump. Any practicable number of relays may be made.

To prevent a sump from going dry, each relay should be increased about 20 feet in elevation over the one below it if the pumpers are of similar capacity. For example, if the first sump is 200 feet above source of supply, the second sump should be 220 feet above the first, and so on.

Where a tanker can be driven to water source, it can be used for the first relay, possibly supplying two sumps. Heavy-duty pumpers may also be advantageous for this use.

Gravity Systems: If streams or springs are so located in relation to a fire that gravity lines can be used, they will provide a constant supply of water without the difficulties and extra expense involved in use of power pumpers. A gravity line is considered feasible where an adequate supply of water is available at an elevation of not less than 40 feet above the point where water is to be used.

When putting in a gravity line, be guided by the following:

- l. Use a special canvas intake or a metal funnel. If such equipment is not available, a short piece of pipe may be used, or the end of cotton-jacketed rubber-lined hose line may be immersed in the stream. In any case, the intake should be screened.
- 2. Place mouth of the intake well below water line, so air will not be sucked into the hose.
 - 3. The drop should be fairly steep for the first 25 to 100 feet.
- 4. If pressure is low, connect only one length of hose at a time and permit water to run through before connecting the next length. The resistance of a long line of soft hose may be great enough to prevent water from getting through under low pressure. The hose will appear flat even when carrying water, except near the nozzle. This is normal in a gravity system.
- 5. Lay hose in as straight a line as possible. There should be no sharp bends over logs, poles, or rocks. The line may be laid into a depression or canyon and out again, provided no part of it is higher than the intake.
- 6. Where the fall is considerable, it may be necessary to relieve pressure in the lower part of the line to avoid hose breakage. This may be done with a relief valve, siamese valve or take-off coupling, or a larger nozzle may be used. If proper equipment is not available, relieve pressure by loosening connections. The best method, of course, is to take off branch lines and use more than one nozzle.

R-6 F.C. Hdbk. Added 4-28-49

Equipment Operation and Care

Delays due to breakdown of power equipment, ruptured hose, and other failures are costly, and they may result in a fire getting away. It is expected that all equipment will be in first-class shape when it arrives on the job. Thereafter, it is up to operators and overhead to keep it working.

Portable Power Pumpers

Instructions for operating pumpers are furnished by manufacturers on plates attached to pumpers or in booklet form. The following instructions are intended to emphasize certain things and to cover important points that may not be in the manufacturer's instructions:

Two-cycle Pumpers: These are powered with high-speed two-cycle engines. A two-cycle engine is "temperamental" and relatively, much less efficient than a four-cycle engine. The only reason for using it is to reduce weight and increase compactness. The following points are very important in the operation of two-cycle pumpers:

- 1. Watch unit closely at all times. It cannot be left for short periods, as may be done with a four-cycle unit.
- 2. Use proper amount of lubricating oil, accurately measured, and mix it thoroughly with the gasoline. If this is not done, trouble is sure to result. Use S.A.E. 30 detergent oil and "white" gasoline.
- 3. Stop engine by shutting off gasoline supply (unless it is to be started again very soon), so that oil will not settle in the carburetor and make starting difficult. Shake gas tank just before starting.
- 4. Do not race engine under light load. Watch load and use throttle as necessary.
- 5. Use a relief valve, or a combination check and relief valve, at pump. If this is not done, a kink in the hose may throw a very heavy load on the pumper momentarily and cause serious damage. Set valve at a reasonable pressure, ordinarily not over 200 pounds.
- 6. See that water flows freely from pipes leading from cylinder jackets. Test water temperature with the hand, and regulate flow so that water is nearly as hot as can be borne. Never run unit when not pumping water.

Two-cycle pumpers in use are mostly Pacific Marine Type Y and Edwards Model 85. The Type Y should include the manufacturer's Service Manual. The Model 85 should include Parts Book No. 20 or later instructions provided by manufacturer.

A number of Type NY pumpers have been obtained from Navy surplus. These were designed for relatively low pressure (about 110 p.s.i. maximum) and correspondingly high capacity. Some of them have been overhauled and the pump rotors changed to produce standard pressure and volume.

Four-cycle Pumpers: Medium-weight pumpers of this type are Pacific Marine Type Z, Edwards Model 40, and Bingham. All are powered with Briggs and Stratton Model Z engine, single-cylinder, air-cooled, and have a speed governor. Each outfit should have a copy of Parts and Instruction Book for Edwards Model 40 and Operating Manual and Parts List for Briggs and Stratton Model Z engine.

The engine in this unit is relatively low speed and is lubricated by oil in the crankcase. It is quite dependable and, since it is governed, the unit can be left alone for short periods under normal pumping conditions. S.A.E. 30 lubricating oil should be used.

Heavy-duty four-cycle pumpers are Pacific Marine Type U, Edwards Model 80, and Edwards Model 120. The first two are powered with four-cylinder water-cooled engines. The cooling lines should be watched, but there is not as much danger from clogged pipes as in the high-speed two-cycle engines. The Model 120 is powered with a two-cylinder air-cooled engine. This engine is governed and equipped with fuel pump and oil-pressure gauge.

All pumps in the above-described units are rotary-gear type. They should be lubricated according to manufacturers' instructions. A relief valve should be used with any pump of this type to prevent possible damage due to a blocked hose line and to permit use of shut-off nozzles when desirable.

General Instructions: Some things regarding the operation of portable pumpers not mentioned above are as follows:

- 1. Set pumper level, as close to water source as possible. Power used to draft water through suction hose is not available for forcing water through discharge hose. It is particularly important to keep vertical distance between pump intake and suction strainer to the minimum.
- 2. Never operate pumper with suction hose disconnected or with lower end out of water. Where pumpers are operated in relay, if one is stopped, those above it must be stopped quickly to prevent them from running out of water.
- 3. Connect suction hose strainer tightly and submerge it completely, in proper position, with screen up. It should not rest on a mud or gravel bottom, as dirt and small pebbles may be drawn into pump. A rotary-gear pump is particularly subject to damage from abrasive material because of the close clearances between rotors and the housing or liners. Appreciable wear causes excessive slippage of water, with consequent loss of draft and pressure. Place the suction hose strainer on a rock or log, or if necessary tie it to a stake driven in the stream bed.

- 4. If a rotary-gear pump fails to draft, check for air leaks in suction line or through pump packing.
- 5. Keep the pumper clean and all bolts and nuts tight. Particularly see that flywheel nut is secure.
- 6. Do not over-lubricate the unit. Follow manufacturer's instructions. Late Model Edwards pump heads do not require current lubrication. Too much in bearing cases will cause heating.
- 7. Install a check valve at pump to hold water in hose lines when pump is stopped. A combination check and relief valve may be used.
- 8. It is a good idea to install a siamese valve at pump to facilitate starting against a load, or to use a relief valve for this purpose by resetting it to low pressure. After engine is started, the open side of the siamese can be closed gradually or relief valve crewed down to permit pump to pick up the load gradually.
- 9. Where shut-off nozzles are used, they should be closed slowly so as not to put a heavy back surge on the hose.

Tank Trucks and Slip-on Units

Several kinds and sizes of tank trucks and slip-on units are in use. General instructions for their operation and care, and special instructions applying to each general type, have been prepared, and a copy is carried in the glove compartment of each truck or the tool box of each slip-on unit. All personnel assigned to tank trucks and others who may need to operate them in emergencies should be familiar with these instructions.

Discharge Hose

Standard hose used for main lines in gravity and portable pumper systems is $l\frac{1}{2}$ -inch, either cotton-jacketed rubber-lined (C.J.R.L.) or linen. One-inch C.J.R.L. hose is standard for branch lines; 3/4-inch hose on hand will be replaced with l-inch as it wears out. Tankers have 3/4-inch rubber hose on the live reels, and $l\frac{1}{2}$ -inch hose is carried for extending the live reel lines or for attachment to $l\frac{1}{2}$ -inch discharge outlets. "White" slip-on tankers are equipped with l-inch C.J.R.L.

Linen hose is about one half as heavy as C.J.R.L. It also is less subject to fire damage when in use, because of sweating which keeps it wet throughout. Sweating is a disadvantage, of course, where water is scarce. Another disadvantage of linen hose is greater friction loss because this hose has no smooth inner lining.

Important things to consider in the handling and care of hose are as follows:

1. New $1\frac{1}{2}$ -inch standard C.J.R.L. and linen hose has a safe working pressure of 350 pounds. Age and condition of the particular hose on the job must be considered, even where the above pressure is available, so as

R-6 F.C. Hdbk. Added 4-28-49 No. 51 not to apply more load than hose will stand. If the head (elevation) in a pumper system is too great, install one or more relays. If too much pressure accumulates in a gravity line, relieve it with a siamese or relief valve, or by loosening connections. Use the best hose near the pump, or at lower end of a gravity line.

- 2. Do not lay hose over sharp rocks or limbs if possible to avoid it. Particularly, see that hose near a pumper does not rest on sharp rocks or over things which may soon wear a hole in it because of constant vibration.
- 3. Lay hose in as straight lines as practicable. Avoid sharp curves or kinks which will put a strain on hose when pressure is applied.
 - 4. Keep hose away from oil, grease, and acids:
- 5. Keep hose out of fire, especially C.J.R.L. and rubber hose. Because of sweating, there is little danger of burning linen hose, provided it is filled with water under pressure.
- 6. Remember that friction loss increases rapidly with decrease in inside diameter of hose (See tables). Use $1\frac{1}{2}$ -inch hose for long lines, and also for shorter ones where it is necessary to pump against a head. Use smaller hose, in <u>short</u> lengths from take-off connections of siamese valves installed in $1\frac{1}{2}$ -inch lines.
- 7. Have plenty of good gaskets on hand. Use spanner wrenches as little as possible. If gaskets are right, hand tightening of connections is sufficient.
- 8. Stow hose in trucks in such manner that it will not slide around or be damaged by tools or other articles. See that threads are protected.
- 9. Leaky or burst lengths of hose should be tied in a knot and returned to camp.
- 10. To prevent abrasive wear avoid dragging hose over sand, gravel, or rocks. Hose filled with water is especially subject to wear in dragging.
- ll. After the job is over, get all hose back to the ranger station or other point as soon as possible. Do not allow it to lie around wet, as mildew may start. The objective all along the line should be to have C.J.R.L. and linen hose cleaned and dried as quickly as possible after use.

Rolling and Laying Hose: The single roll, with male connection at center, is commonly used. In laying, the outer end is connected to pump or the previous hose length, then hose is unrolled along the ground.

Another method is to double the hose length, with female and overlapping male end by two feet or more, than roll from center so that female end will be on the outside for protection of the male threads. In laying, after female end has been connected, male end may be carried forward and hose will unroll without tangling. This method is particularly useful for long lengths of linen hose.

R-6 F.C. Hdbk. Added 4-28-49 No. 51 By any method, care should be taken in laying to see that male connections are always forward, so that delays caused by the necessity of reversing lengths after they have been laid will be avoided.

A good way to carry and lay linen hose is to lap it back and forth in a packsack, with male end at bottom. Then, after female end has been connected, the packsack can be carried forward and hose payed out as fast as a man can walk. Four hundred feet of $l\frac{1}{2}$ -inch hose can be coupled and lapped in a packsack for laying in this manner. The packsack also protects hose while it is being hauled to the fire. Linen hose is more subject to damage from chafing than C.J.R.L.

Accessories

There should be in every power pumper outfit and every tank truck a list of tools and accessories belonging to the outfit or truck. For gravity systems, include intakes, gaskets, siamese valves, take-off couplings, and nozzles. One or more relief valves may be included.

Adapters (bushings, reducers): For portable pumpers $l_{2}^{\frac{1}{2}}$ " to 1" adapters may be needed to connect 1" hose lines to $l_{2}^{\frac{1}{2}}$ " lines or to reduce one side of siamese valves.

For tankers, a 3/4" to $1\frac{1}{2}$ " or 1" to $1\frac{1}{2}$ " adapter is used to extend a live reel line by attachment of $1\frac{1}{2}$ —inch hose; 3/4" to 1" and $1\frac{1}{2}$ " to 1" adapters are needed to use 1-inch shut-off or dual nozzles on 3/4-inch and $1\frac{1}{2}$ -inch hose.

Check and Relief Valves: The purpose of a check valve is to hold water in a hose line when pumper is stopped. It should be installed near the pump, but preferably connected through a short piece of hose.

A relief valve is essential wherever shut-off nozzles are used on discharge lines from a rotary gear or other type of positive-displacement pump. A relief valve should be installed, if available, even though shut-off nozzles are not used, to prevent damage to pumper and hose if discharge line is blocked suddenly by kinking or otherwise.

The check and relief features may be combined in a single unit. If a combination unit is not available, a check valve and a relief valve may be installed together, or a short distance apart, in discharge line near pump. Where this is done, the relief valve should be connected between check valve and pump.

In starting against a load in discharge line, held by a check valve, the relief valve may be opened temporarily, then screwed down gradually to proper pressure setting as the pump picks up the load. A siamese valve can be used for this purpose, but it does not afford protection against abnormal pressures.

In a tanker, the relief valve is always connected in such manner that escaping water will be returned to tank. Where a relief valve is used with a portable pumper, the escaping water may be by-passed to suction side of pump if suitable connections are available.

Siamese Valves: The most common type of siamese has a $l\frac{1}{2}$ -inch female outlet and two $l\frac{1}{2}$ -inch male outlets, with a central core that can be turned so as to connect either or both male outlets to female outlet. Another type has two independent valves to control male outlets.

There are three main uses for siamese valves: To put in branch hose lines from a main line, to install at end of a line so that hose can be connected without stopping the pump, and to install at pump to facilitate starting against a load.

Take-off Connections: These are useful for taking off 1-inch or 3/4-inch lines from a $1\frac{1}{2}$ -inch line, and for filling backpack cans. They may also be used to relieve pressure in gravity lines, or near pumper to facilitate starting against a load. The take-off outlet has 1-inch male iron pipe thread and a female thread for insertion of a standard hose bibb, which should have a 3/4-inch male garden hose thread at outlet.

Suction Hose and Strainer: In smaller sizes commonly used with portable pumpers and light tankers, suction hose may be either wire-inserted or plain. The larger sizes are wire-inserted. Regardless of kind, it is important to see that hose is not run over by a truck or tractor, and that it is protected from sharp instruments and oil or grease.

Keep in mind the purpose of a strainer—to prevent debris and abrasive material from damaging the pump—and see that strainer is placed in water source so as to accomplish this most effectively.

With a centrifugal pump, a foot valve just above suction hose strainer is required for priming.

Nozzles: In general, there are two kinds of nozzles: Solid stream and spray, or fog. The simplest kind of nozzle is the plain play pipe. It is desirable that nozzles of this kind be threaded at outer end for attachment of tips of various sizes, from 1/8-inch to 3/8-inch.

Fog nozzles used in Region 6 are known as low pressure type; that is, they are effective at 100 to 150 p.s.i., or even less. The general types are as follows:

1. Rotary shut-off type. The best known example of this type is the garden hose nozzle. The spray pattern is a hollow cone, which is less effective than a solid pattern.

- 2. Impinging jet type. In this type two streams strike, or impinge on, each other at approximately a right angle. One side of the twin nozzle for backpack pump is of this type. Some larger nozzles use the same principle, with numerous pairs of impinging streams which deliver a solid spray or fog that is quite effective at 100 p.s.i.
- 3. A new type which has interior discs to break up the stream and small holes at a certain angle found most efficient at 100 to 150 p.s.i. This type projects a solid spray or fog ahead.

Types described under 2 and 3 above are ordinarily part of a dual nozzle, consisting of a valve body, a solid stream tip, and a spray tip. The valve lever has three positions: Shut-off, fog, and solid stream. There is an advantage in being able to change quickly from solid stream to fog, and vice versa, and for this purpose the lever type nozzle is better than the rotary type.

Combination or dual nozzles are particularly desirable with tankers, as a shut-off nozzle is needed and the conservation of water may be very important.

<u>Protection of Threads</u>: Threads on hose couplings and other brass or aluminum fittings are subject to damage and should be carefully protected. Keep caps on tanker and portable pump outlets when they are not in use. See that siamese valves, take-off couplings, and other threaded accessories are carefully handled in transit and on the job. See that male ends of hose lengths are rolled inside. If necessary for protection of male threads where caps are not available, friction tape may be used.

Safety Precautions

Most of the safety rules printed on the back of the Firefighter's Contract, Form 106-R6, are applicable to men using water equipment. They are as follows:

- 1. Watch handholds and footing while walking, climbing, or working.
- 2. Guard against overhanging objects while riding in an open truck.
- 3. Snags, limbs, and trees often fall without warning. Watch for them.
- 4. Keep constant guard for rolling material on steep ground.
- 5. Avoid walking in hot ashes.
- 6. Bathe feet in cold salt water after work to avoid blistering. Keep socks clean.
 - 7. Do not drink too much cold water at one time.
- 8. Be sure to have all minor cuts, bruises, burns, etc., treated immediately by first-aid man.
 - 9. Report all accidents promptly to your foreman.

R-6 F.C. Hdbk. Added 4-28-49

No. 51

Other precautions that apply particularly to the use of water equipment are given below.

- l. Drive tankers and other trucks carefully and always with a good margin of safety. Wrecked equipment will not put out any fire. Observe all state laws and federal regulations.
- 2. Great care is necessary when using water around power lines. Never direct a stream at a power line or transformer; to do so is to flirt with death. Watch out for down power lines, and wire fences or wet ground in the vicinity of such lines.
- 3. When using a tanker for control, be sure there is a way out in case the fire should do the unexpected and make it necessary to get away in a hurry. Do not park a tanker inside a burn without puddling around the tires.

Reference Tables

1. Maximum Practical Suction Lift

Eleva	ation	Lift in	Feet
Sea 3	level	28	
1320	feet	26	
2640	11	25	
3960	17	24	
5280	11	22	
6600	tt.	20	
7920	îı	19	

2. Feet Head of Water and Equivalent Pressures

Ft. Head	Lbs. per Sq. In.	Ft. Head	Lbs. Per Sq. In.
10	4.33	100	43.31
20	8.66	150	64.96
30	12.99	200	86.62
40	17.32	250	108.27
50	21.65	300	129.93
60	25.99	350	151.58
70	30.32	400	173.24
80	34.65	500	216.55
90	38.98		

3. Discharge in Gallons per Minute at Various Nozzle Pressures

Lbs. Per Sq. In.			Size o	f Nozzle		
Noz. Pressure	1/8"	3/16"	1/4"	5/16"	3/8"	1/2"
10	1.4	3.1	5.6	8.6	12.5	22.2
20	2.0	4.4	7.8	13.2	17.7	31.4
30	2.4	5.4	9.6	14.9	21.6	38.4
40	2.8	6.2	11.1	17.3	25.0	44.5
50	3.1	7.0	12.4	19.4	27.9	49.6
60	3.4	7.6	13.6	21.3	30.6	54.3
70	3.7	8.2	14.8	23.0	33.1	58.9
80	3.9	8.8	15.7	24.5	35.3	
90	4.2	9.3	16.6	26.0	37.5	66.6
100	4.4	9.9	17.6	27.4	39.5	70.2

 $R=6\$ F.C. Hdbk Added 4-28-49 No. 51

4. Pump Pressures Required for Various Nozzle Pressures Through Different Lengths of C.J.R.L. Hose

Nozzle Pressure	: Leng					Feet 3000			th of 1000			Line,	
				1	/8-in	ch No	22.	Le					
50 60 70 80 90 100	53 64 74 85 95 106	55 66 77 88 100 111	58 69 81 92 104 115	60 72 84 96 108 120	63 75 88 100 113 125	65 78 91 104 117 130		51 61 71 81 91 101	51 61 72 82 92 102	52 62 72 82 93 103	52 63 73 83 94 104	52 63 74 84 95 105	53 64 74 85 96 106
	3/16-inch Nozzle												
50 60 70 80 90 100	61 73 85 96 108 121	71 84 97 110 124 138	80 94 109 124 139 155	90 105 121 138 154 172	99 116 133 151 170 189	108 127 145 165 185 206		53 63 74 84 94 105	55 66 76 87 97 108	57 68 79 90 101 110	59 70 82 93 103 115	61 73 84 96 106 118	64 75 87 98 109 121
				1	/4-in	ch No	ZZ.	<u>le</u>					
50 60 70 80 90 100	82 99 116 132 148 165	109 131 154 175 196 219	136 164 193 218 244 273	163 196 231 261 293 328	190 228 269 304 341	217 261 308 347		56 66 77 87 98 109	60 71 82 92 104 115	64 75 86 97 109 122	68 79 91 103 115 128	72 84 96 108 121 134	76 88 101 114 126 141
				5	/16-i	nch N	OZ:	zle					
50 60 70 80 90 100	129 155 181 206 232 258	195 234 274 311 350	261 314 366	327				61 73 85 97 109 122	69 82 96 110 123 137	76 92 107 122 137 152	84 101 118 134 151 168	92 110 129 146 165 183	99 120 139 159 179 198
	3	/8-in	ch No	zzle					1/2	-incl	Noza	zle	
50 60 70 80 90	72 87 101 116 130 145	(1½-i 88 106 124 141 159 177	nch H 104 125 146 167 188 209	ose) 120 144 169 192 217 241	136 164 191 218 246 273	152 183 214 244 275 305	:	121 145 170 193 217 242	(1 121 205 241 274 308 343	131 266 312 355	2h Hos 136 326		146

5. Friction Loss in Pounds Pressure Per Square Inch for Each 100 Feet of Hose

Gallons	l-inch	la-inch	$1\frac{1}{2}$ -inch
Per Minute	C.J.R.L. Hose	C.J.R.L. Hose	Linen Hose
5	.8	.1	
10	3.5	.5	1.0
15	7.2	1.0	2.2
20	12.3	1.7	3.6
25	18.5	2.6	5.5
30	26.0	3.6	8.0
35	35.0	4.8	10.0
40	44.0	6.1	13.0
45	55.0	7.6	16.0
50		9.3	20.0
70		17.0	33.0
100		33.0	72.0

To obtain pump pressure needed for desired delivery through C.J.R.L. hose:

- 1. Select desired delivery in gallons per minute, and size of nozzle, then read corresponding nozzle pressure in Table 3.
- 2. Select desired size and length of hose line, then read pump pressure in one of the tables under 4, on line with nozzle pressure obtained from Table 3.
- 3. If nozzle is above pump, estimate vertical distance and add equivalent pressure from Table 2. If nozzle is below pump, subtract equivalent pressure.

Example: It is desired to obtain 15 gallons per minute through a 1/4-inch nozzle and 2000 feet of $1\frac{1}{2}$ -inch hose, with nozzle 220 feet above the pump. Nozzle pressure (Table 3) will be about 70 pounds. Pump pressure (Table 4) would be 91 pounds with nozzle at pump level. Head pressure will be 95 \neq pounds (Table 2 - 86.62 \neq 8.66). Therefore, pump pressure will need to be 186 pounds (91 \neq 95).

FIRE CONTROL HANDBOOK REGION 6



PART III SUPPRESSION

CHAPTER 24

ORGANIZATION FOR

CONTROL LINE CONSTRUCTION

FIRE CONTROL HANDBOOK

REGION 6

PART III

SUPPRESSION

CHAPTER 2

ORGANIZATION FOR CONTROL LINE CONSTRUCTION

Part III - SUPPRESSION - Chapter 2

ORGANIZATION FOR CONTROL LINE CONSTRUCTION

Table of Contents

																		Page No.
Introduction				200-1) mages	'mprt-	J. edw.).	evenja						III-2-1
Line Construction																		III-2 2
Locating Clearing																		III-2-2 III-2-2
Digging -																		III-2-3
Burning Out or Backfiring	- ,	-		-	-	À.	rest i	par	***	Algen	40)	-	gans	w.		****		III-2-3
Line Holding																		III-2-3
Snag Falling																		III 2-3
Spot Fire Hunting								**	100.0	130		9.				-		III-2-4
Patrol and Mop-up					-7		-5											III-2-4
Organization																		III-2-4
Overhead																		III 2-4
Size of Organization Progressive Assignments an																		III 2-4 III-2-4
11081000110 HDD181mol100 att	α. 1	····	, a. ca.	001														~ 4
Equipment							per	Merc 2	-			ribb	. 1000	(84)	las	24	east?	III-2-5

ORGANIZATION FOR CONTROL LINE CONSTRUCTION

Introduction

The one-lick method of control line construction has been found to be the most effective system of managing men to obtain their maximum output of held line. It has been tested under various conditions of cover type and topography throughout Region 6 and its use is now standard practice.

The successful use of one-lick clearing and digging crews led to the development of a fast-moving spearhead for control line construction. A further development on large fires is to organize and manage all crews and equipment from the line scouts to patrolmen on a functional basis similar in fasion to an individual one-lick crew. Under this method each crew within a functional unit continually progresses forward at the same rate of speed as the lead crew and at all times stays in the same relative position. For a graphic description refer to Figures 1 and 2 of this chapter.

Essential and advantageous features of the one-lick functional crew method are:

- 1. The entire assembly of control line construction men or machines, or both, moves forward without changing their relative positions in line.
- 2. Tools are distributed to men in the line in the order in which the tools will be needed, and in the balanced quantity required by the work to be done. Dual purpose tools are provided to take up slack between crews in varying cover types. Where machinery can be used it reduces the number of hand tools needed, especially in the clearing and digging operations.
- 3. Emotional stimulus is developed from the almost continuous forward movement and the feeling of large accomplishment by and identity with the crew.
- 4. Enough men can be assembled in one file to complete the control line as rapidly as the lead man can forge ahead and indicate where the control line is to be located and what work is to be done on it.
 - 5. Adequate water-boy service <u>must be</u> provided.
 - 6. Frequent short rest periods must be taken.
- 7. Men must be properly spaced and cautioned against the danger of being struck with a tool in the hands of another man.
 - 8. First-aid service must be provided.
 - 9. Brush throwers as needed should follow axe crews.

- 10. Pulaski tools as needed should be included with the finishing crew for barking logs, cutting roots, and completing line.
- ll. Older and less able-bodied men should be used in the rear crews to give them the advantage of walking in a partially completed line.
- 12. While trained crews are desirable, crews of inexperienced men may be used successfully, provided available overhead have had training in the use of this method.

Spacing of the men in each crew depends upon the work being done. In clearing and digging operations the men should work as close together as possible without interfering with one another's actions or endangering their safety. In burning out or backfiring, holding, snag falling, patrol, and mop-up, the spacing of the men is governed by the cover type, fuel type, burning conditions, topography, and number of men available.

Proper spacing and forward speed of the crews may be regulated by whistle signals, by calls, or by giving instructions that each man must keep far enough ahead of the man behind to stay out of his way but not to move ahead and leave him. In the latter case the speed of the crew is more or less self-regulating.

In organizing one-lick functional crews it should be kept in mind that there are three phases of the control job to be done: first, <u>line construction</u>; second, <u>burning out (or backfiring) and holding</u>; and third, <u>patrol and mop-up</u>. The various steps in organizing crews for these functional jobs are described as follows:

Line Construction

Locating

From the selected starting point on the edge of the fire, the line scouts and line locators proceed around the fire and select and mark the location of the control line. See Part III, Chapter 1 of the Fire Control Handbook for points to be observed in control line location.

Clearing

The clearing crew is the first functional crew following the line locators and it presses forward as fast as the work can be accomplished. In light clearing a small crew can do the work, but in heavy clearing a large crew, sometimes more than one foreman unit, may be necessary depending upon the amount of work, speed of clearing desired, and the total number of men available. The size of the crew will not only vary with the qualifications and efficiency of the men, but also will be governed by the number of men required to maintain a reasonable forward movement and still leave a completed line behind. It is a common practice to equip the last few men in the clearing crew with Pulaski tools in order that they may chop when the clearing is heavy or dig when the clearing is light.

Digging

The digging crew or crews follow behind the clearing crew. They should be of sufficient numbers to keep up with the clearing operations and at the same time leave behind a completed fire line. The first few men in this crew may also be equipped with Pulaski tools to serve as a balancing unit in the same manner as the last few men in the clearing crew.

Burning Out or Backfiring

The burning-out crew follows immediately behind the digging crew, if the two-foot or parallel fire-fighting method is being used. This crew should proceed forward similar to other one-lick organizations and be of sufficient size and so equipped that the unburned material adjacent to the fire line can be set afire and at the same time the crew keep up with the digging operation.

If the indirect method of fire fighting is being used, backfiring will also be a part of the control line construction but it may be done at a different time than when the clearing and digging operations are conducted (see Chapter 1, Part III of the R-6 Fire Control Handbook). In that case, there would be a break in the continuity of action by a functional unit, but otherwise the same organizational methods would be used.

Holding

One or more holding crews follow behind the burning out crew to hold the fire until it has cooled down to such a point that the line can be taken over by follow-up patrol crews. In light, fast burning fuels, the size of the holding crew will be very small, but in heavy, dry fuels, jungle types, or in snag areas, the number of holding crews may be larger and the tasks more difficult than those performed by the clearing and digging crews. In the latter case, it is imperative that sufficient properly equipped crews be added for holding purposes to insure their keeping up with the crew immediately in front of them. It takes extremely close supervision and correlation to effectively manage holding crews and keep them progressing forward in the same manner as other one-lick crews.

Snag Falling

A large number of snags to be felled present a special problem in organization. If snags have to be felled ahead of burning-out operations, it will be necessary to have a snag-falling crew working alongside the clearing and digging crews, provided a few sets of fallers attached to the clearing crew cannot fall all necessary snags. If snags have to be felled to hold a fire, a falling crew can work with the holding crews or fallers can be assigned to those crews. If additional snags have to be felled to make the fire safe, snag fallers should be assigned to work with patrol crews and with those on mop-up.

R-6 F. C. Hdbk.
Page revised 5-5-41
No. 1

Spot Fire Hunting

Spot fire hunters should be provided and kept moving forward abreast of the crews. Their number and the distance that they will work from the fire edge will be determined by the sector or division boss.

Patrol and Mop-up

Behind and taking over the line from the holding crews will be the patrol and initial mop-up crews. The members of the first patrol crew will usually be spaced at shorter intervals than those in the rear where the fire is cooling down. The patrolmen should be kept moving forward so that they will keep up with the holding crew. They should do preliminary mop-up work or encourage the fire to burn out. (Final mop-up crews will usually be organized on a station or sector basis. Refer to Chapter 1, Part III of the Fire Control Handbook.) Follow-up should come from the rear so each patrolman can keep his same relative position in his crew.

Organization

Overhead

Each functional crew will be in charge of a foreman who will supervise the work of the members of his crew in the same manner as the members of a single one-lick crew. A group of 2 to 4 foreman crews will be supervised and their functional duties correlated by a sector boss. For each 2 or more sector bosses, a division boss will be in charge. The latter is the key man if the organization is to be effective. If feasible, the division boss should use a saddle horse, and in most cases he should be equipped with a radio and have available one or more messengers. Sector bosses, in many cases, will need radios, and in some cases it will be desirable to so equip foremen. Speed is paramount, so the correlation between crews is especially important. Advance general and detailed scouting, a well-located line, an aggressively-spirited clearing crew, and vigorous supervision are vital.

Size of Organization

An almost unlimited number of crews can be used with this method of organization. A few are used in light fuels but a large number can be used effectively in heavy fuels or where the holding job is particularly difficult. As the work period is extended and the line lengthened, more crews and men are needed for the holding and patrol functions. On any portion of a fire this type of organization is adaptable to a few men or to 200 or more if needed. From a single point it is also possible to start functional units in two directions around the fire edge.

Progressive Assignments and Replacements

It is desirable that the organization plans for suppressing a large fire provide for the clearing crew to be the first crew to arrive at the starting point for control line construction. Likewise, if other crews are

R-6 F. C. Hdbk.
Page revised 5-5-41
No. 1

equipped to do a certain functional job, it is of considerable advantage to have these crews dispatched so they will arrive at the starting point in the same order as they work on the line. The arrival time of the crews ordinarily varies a few minutes, giving time to line out each crew before the next arrives. This avoids confusion and inactiveness. With a large number of crews in heavy fuels, the last holding crew may be an hour or more behind the clearing crew. Patrol crews may be progressively assigned for hours or all day as the amount of held line increases.

A fast pace is tiring and replacements must be made when crews become tired. The first to be replaced will usually be the lead crews — the clearing and digging men. To avoid confusion replacements should, if feasible, be brought direct to the head of the unit without walking them along the fire line and past working crews. If all men are equally skillful in the use of tools, which would be quite unusual, replacements can be made from the rear. If this can be done, the digging crew takes over the clearing, the burning crew takes over the digging, and so on until fresh replacements take over the last patrol duties.

Equipment

The usual standard equipment will be used, and in general will be no different from that used in any other method of organization. Clearing and line-building machinery can often replace functional clearing and digging crews. If machinery is used, provision must be made for prompt replacement of operators and adequate servicing of the equipment so the head end of the organization will not have to slow down or stop. Extra tools of various kinds are usually necessary for replacing those broken, for shifting between crew members to have the proper tool available for each particular job, and to have the proper tools to initiate action on a breakover should one occur any place along the line.

If light weight, self-contained outfits (stampede packs) are available, they should be used in inaccessible or rough areas. With these packs the crews can rest, eat, and sleep on or near the line, if that is necessary or desirable, and not have to make fatiguing trips to a fire camp. It is particularly important to so equip the crews in the lead, as ordinarily they would have the farthest to walk and usually would be the most tired. Plans should be made to keep the packs with the crews by man pack or pack horse. Consideration should also be given to dropping cooked foods, water, and other necessary items from airplanes or to packing supplies in with pack horses.

As it is essential to effectively correlate the work of the various functional crews within a unit, radios have a definite place in the organization, particularly in rough country, in heavy fuels, or with large crews. Scouts and the main overhead should have radios for their use if they are available. Ultra-high frequency equipment can be used for control line communication and usually for communication from the line to a fire camp or headquarters.

SAMPLE CONTROL LINE ORGANIZATION CHART

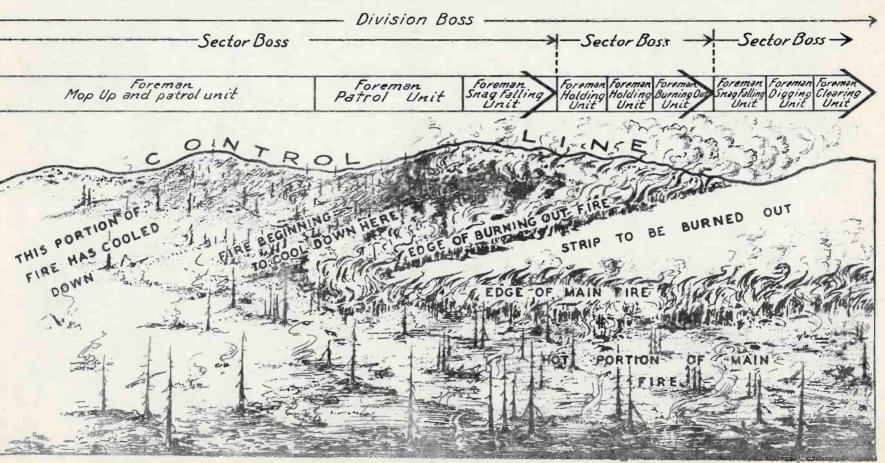
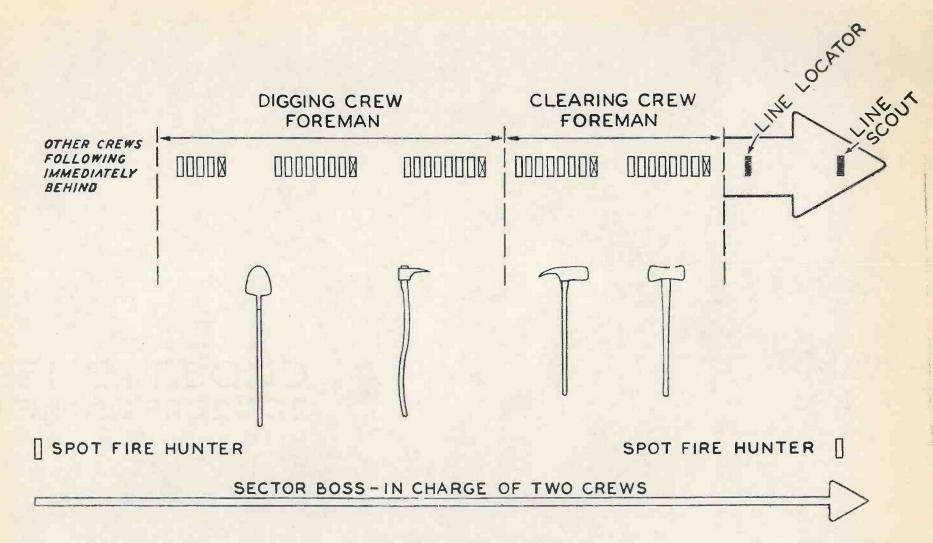


FIGURE !



ORGANIZATION CHART OF ONE-LICK CLEARING AND DIGGING CREWS
FOR FIRE LINE CONSTRUCTION

FIRE CONTROL HANDBOOK REGION 6



PART III SUPPRESSION

CHAPTER 3
SCOUTING ON LARGE FIRES

FIRE CONTROL HANDBOOK

Region 6

Part III

SUPPRESSION

Chapter 3

SCOUTING ON LARGE FIRES

Part III - SUPPRESSION - Chapter 3

SCOUTING ON LARGE FIRES

Table of Contents	
	Page
Scouting Unit Organization	III-3-1
Scouting Unit Duties	III-3-4
Scouting Boss	III-3-4
Head Ground Scout	
Ground Scout	
Coordinate System of Reporting	
Map Locations	III-3-7
Map Legend to be Used by Ground	
Scouts	
Recorder	
Draftsman	III-3-11
Communication Assistant	III-3-11
Telephone Boss	III-3-12
Radio Boss	III-3-13
Reminder List for Line Camp Radio Operators	III-3-14
Radio Operating Procedure	III-3-1
Communication Networks	III-3-16

SCOUTING ON LARGE FIRES

On the majority of fires the smokechaser, the foreman, or the fire boss is able to keep informed on the progress of the fire, existence of spot fires, dangerous hot spots and like information while carrying on fire duties. As fires become larger, requiring larger crews and consequent intensive supervision, the use of scouts becomes necessary to gather this information.

Two kinds of scouting are usually necessary on a large fire:

- l. <u>Line scouting</u>, to furnish line overhead detailed information regarding a specific portion of the perimeter of the fire being worked on. The line scout, working under the direction of the division or sector boss, is the advance control line locator. He also locates spot fires and marks routes to each and keeps currently informed on progress being made on adjoining portions of the fire. Line scout duties are covered in more detail in Chapter 1, Fire Fighting.
- 2. General scouting, to gather, record, and report general information on ground conditions and the progress of the fire to the fire boss. This type of scouting is done by a scouting unit, which is also responsible for related service such as communication. The scouting unit is supervised by a scouting boss, working directly under the fire boss, and should be equipped to furnish the following general services:
 - 1. Scouting foot, horse, or aerial.
 - 2. Communication telephone and radio.
- 3. Assembly of weather data and predictions and local fire behavior data.
- 4. Assembly of daily fire maps, organization charts, and progress notes on the fire.

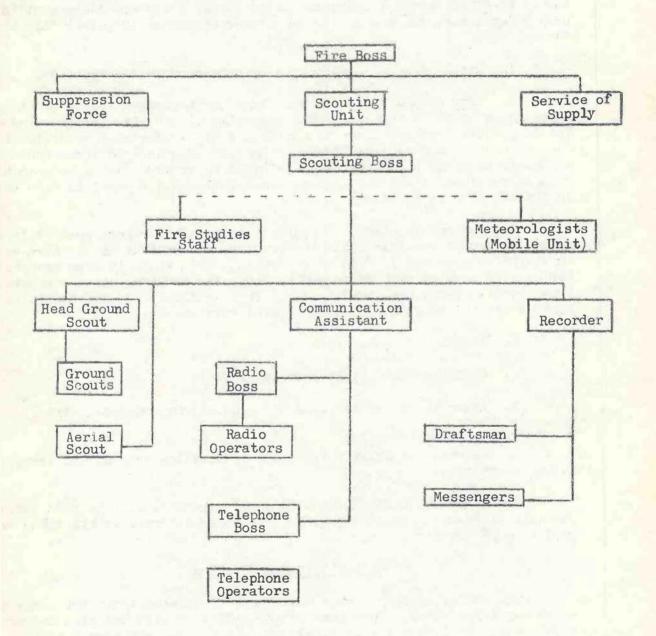
The assembled information will enable the fire boss to make the best possible management decisions and to keep fully informed at all times on the condition of the fire.

Scouting Unit Organization

The following charts show Scouting Unit organizations for large and extremely large fires. The organization will vary with the size and accessibility of the fire and with local conditions. For efficient scouting it is very desirable that the necessary organization be kept intact throughout the control period. This is particularly true with trained ground scouts, as they soon become familiar with topography and fuel types.

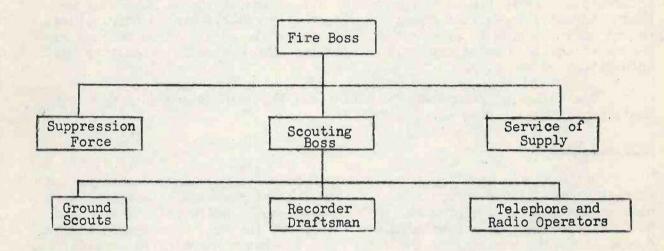
SCOUTING UNIT ORGANIZATION

Extremely Large Fires



SCOUTING UNIT ORGANIZATION

Large Fires



Note: Duties of these positions are a combination of the duties outlined for positions in the scouting unit organization for extremely large fires. The large fire organization will serve most fires, and therefore forest units should be based on this chart.

Scouting Unit Duties

The scouting unit should be on duty as soon as possible after a fire becomes large. The first morning's work is often partially ineffective for lack of even general information. The fire boss needs all the information he can get as to the location and condition of the fire before daylight of the first morning, so that he can properly equip and place his crews on the fire. Prompt effective scouting service during the first night should provide this information. From then on the ground or aerial scouts should currently report changes, spread, spot fires and progress in establishing control lines. Ground scouts should be properly equipped and their work planned in such manner as to enable them to camp out on the line when desirable, reporting their information by radio.

The following describes the duties and lists the major jobs for each position in the scouting unit.

Scouting Boss

<u>Duties</u>: The scouting boss is responsible for securing, recording and submitting to the fire boss in usable form all information reasonably obtainable on the suppression problem. His reports should ordinarily be confined to facts; however, if assumptions are necessary, the fire boss should be informed as to the accuracy of the report and the basis for derived conclusions.

The scouting boss will organize and direct the activities of the various unit members and endeavor to secure reliable information at the earliest possible time, and in sufficient detail to have a complete picture of the fire at all times. Except for the fire boss, the scouting boss should be the best informed man on the fire.

Field trips requiring more than two to four hours' absence from headquarters should not ordinarily be made by the scouting boss. Sixty to eighty percent of his time on the larger fires should be spent at the unit headquarters in order to provide adequate supervision and coordinate the action of his organization.

The scouting boss should accompany the aerial scout and a local observer on air scouting trips, provided travel time to and from the airport is not excessive.

Reminder List

- 1. Check with fire boss:
 - (a) General situation -- extent of fire, direction of spread, number and location of men, plan of action.
 - (b) Names and whereabouts of scouts already on job.

- (c) Explain service of scouting unit, especially communication, recording and drafting.
- (d) Obtain request for specific scouting needs, if possible.
- 2. Hold brief scouting unit conference.
 - (a) Give members data.
 - (b) Double up on duties of unit personnel if any members are temporarily missing.
- 3. Consider and investigate additional sources of information.
 - (a) Lookouts.
 - (b) Airplanes.
 - (c) Any personnel that may have information on fire, such as truck drivers, packers, guards, fire overhead, and local woodsmen.
 - (d) Photographs that may be available for area.
 - (e) Suppression plans for hazardous areas.
 - (f) Timber and range reconnaissance maps, topographical sheets.
- 4. Place request for:
 - (a) Radio operators.
 - (b) Ground scouts.
 - (c) Equipment, including radios, batteries, emergency wire, telephones, and maps. (Should be ordered through SOS).
- 5. Check currently with communication man, head ground scout, and recorder to see that work is running smoothly.
- 6. Keep in contact with fire boss and arrange to attend his conferences with overhead.
- 7. Observe condition of scouting personnel, and take steps to prevent overexertion.

Head Ground Scout

<u>Duties:</u> The head ground scout is responsible to the scouting boss for deploying the ground scouts and correlating all the information received from

them. He will spend considerable time in the field working with the scouts. especially on the difficult and important technical assignments. In the absence of the scouting boss the head ground scout will act as boss of the unit.

Reminder List

- 1. Size up scouting job and ground scouts available. Assign designated areas to scouts as necessary.
- 2. Instruct new scouts as to method of reporting data.
- 3. Correlate information in scout messages and interview each scout when he returns from a trip.
- 4. Correlate data and give to draftsman with specific instructions for placing on map.
- 5. Map should be ready for evening conference, usually about 8:00 P.M.
- 6. Equip ground scouts so they can stay on the fire from one to three days and communicate by radio.

Ground Scout

Duties: Ground scouts are responsible to the head ground scout and will secure, record and transmit all information regarding the fire that is of value to the fire boss.

They will cooperate with all line officers to the fullest extent possible. They should never attempt to advise action to be taken unless it is specifically requested.

Every effort should be made to maintain the communication schedule and transmit all the information possible in the allotted time. A map should be maintained and information placed on it, to be checked upon return to camp. Ground scouts should be equipped so they can remain on the fire for two to three days if necessary, without having to return to a fire camp.

Reminder List

A. Equipment

A scout's pack should contain:

- 1. Map 2. Compass 3. Scale
- 4. Protractor
- 5. Notebook
- 6. Pencil
- 7. Scouting Chapter 8. Radio w/schedule
- 9. Lunches or iron
- rations
- 10. Matches

- ll. First aid kit
- Canteen (1 qt.) 12.
- Light weight bed 13.
- " mess outfit 14.
- 15. Head light with extra batteries

- B. Any of the following information gathered should be reported:
 - (Use coordinate system for reporting map locations).
 - 1. Amount and location of held line, including natural barriers backfired and cold-trailed line. (State whether or not burned out).
 - 2. Amount and location of line to build. Cover type.
 - 3. Rate and direction of spread.
 - 4. Fuels in which fire is spreading (snags, fern, brush, grass, etc.)
 - 5. Wind direction and velocity.
 - 6. Hot spots, vital points of attack, danger spots.
 - 7. Natural fire barriers.
 - 8. Spot fires -- location, size, fuel burning, danger of spread.
 - 9. Slope -- low, moderate, high, extreme -- exposure.
 - 10. Location and names of foremen and number of men with each.
 - 11. Machine shows -- location and type.
- C. Other information to be added to map (use legend).
 - 1. Unburned areas within fire edge and type of fuels.
 - 2. Amount and location of line lost.
 - 3. Location of all features included on map legend.
 - 4. Evidence on incendiary or other man-caused fire.

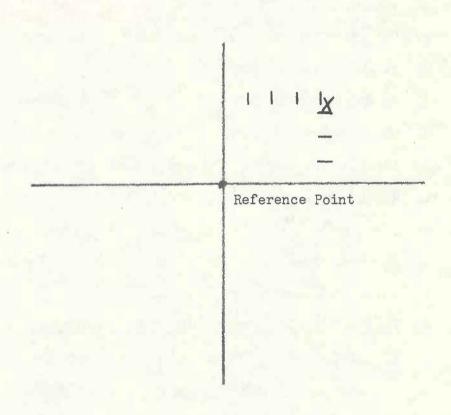
Coordinate System of Reporting Map Locations

The coordinate system will ordinarily be used by scouts in reporting the location of fire line and other points back to headquarters by radio or telephone. This method is used as follows:

- 1. The scale of the map and unit of measurement are decided upon. Usually this will be a 2" scale map and the units will be 1/4" (the distance between the squares on a sheet of ranger's notebook paper).
- 2. A reference point is selected, usually inside the fire boundary. A township corner or lookout point may be used. Control lines are drawn north and south and east and west through this reference point.

3. In describing a point, the number of 1/4" units north or south and east or west of the control lines are given. For example, in describing point X (see sketch) the report would be north 3, east 4. If greater accuracy is desirable, tenths of the 1/4" unit may be used, such as north 3.2, east 4.3. Small scales graduated in 1/4" should be provided the scouts, or the fireman's protractors may be marked off along two adjacent edges. A sheet of ranger's notebook paper can also be used.

This coordinate system can be used with any scale map or unit of measurement. However, it is necessary that these be unmistakably understood by both the sender and receiver of the report.



the fire since its interplant of report winded is in shipe is turn over to the fire boss and avoidment. It was the collect and the property of the fire boss and the collect a

		(Name of Fire	e)	TO, SIN ALTRIPO LOCAL				
(Date	(Date)			(Time)				
		LEGEND						
	Fire line	completed	→	Gravity chance				
	Fire line	to build	À	Base camp (6)				
+	Spot fires	3	25	Camp (No. men)				
	Snags)		<u> </u>	Camp (proposed)				
	Brush)	Hot spots showing type	\otimes	Airplane camp				
	Logs)	of fuel burning	12 MPH	Wind direction and velocity				
	Blow down)		Tel.■	Telephone				
(AL)	Slashing)		SPF 425	Radio				
E CONTRACTOR DE LA CONT	Unburned a	area within	•	Spring and drinking				
	Old burn			water				
mm	Edge of gr	reen timber		Road				
0	Pump chanc	ce Communication	irin Links	Trail				
	Pump			Telephone line				
	- wp		1	Fire break				
			TELL OF	Take or rest				

Recorder

Duties: The recorder is responsible to the scouting boss for assembling for each day all maps, organization sheets, messages and other pertinent history of the fire. He should obtain an accurate account of action taken on the fire since its inception. The report should be in shape to turn over to the fire boss each evening. He may be called upon to prepare a brief evening summary of fire conditions, including size of fire, number of men, cost, etc., for the information of the supervisor and the regional forester. The recorder will also lay out and maintain the unit's headquarters, be in charge of all equipment, and arrange for meals and other services for unit personnel.

Reminder List

- 1. Obtain information on the fire before arrival of the unit. Check following sources if possible:
 - (a) Fire dispatcher.
 - (b) District ranger.
 - (c) Men on fire in early stages.
 - (d) Men in charge of fire at various stages.
 - (e) Fire danger records of nearby lookout stations and weather forecasts.
 - 2. For each day, collect:
 - (a) Map of fire.
 - (b) Communication and scouting personnel maps and charts.
 - (c) Organization sheets.
 - (d) Original copies of all radiograms and other messages, properly initialed by sender or receiver.
 - (e) Fire danger records from nearby stations.
 - (f) Weather forecasts.
 - (g) Photographs if available later.
- 3. Each evening, prepare progress report of the day's action. Should be written in chronological order and contain:
 - (a) Data on weather conditions, rate and direction of spread of fire.
 - (b) Line constructed and held or lost.

- (c) General situation.
- (d) Material under 2 above should be attached.
- 4. Report time of scouting unit personnel, if hired, to camp timekeeper.

 (Check to see that scouts' time is not duplicated in other camps).
- 5. Supervise scouting unit messenger force in camp.
- 6. Lay out area in base camp assigned to unit and maintain in an orderly manner.
- 7. Check equipment in and out.
- 8. Arrange for lunches, meals, transportation and other services.

Draftsman

<u>Duties:</u> The draftsman is responsible to the recorder for preparing maps, charts, placards, and signs as needed. He will requisition maps and materials needed for making maps from the recorder.

Reminder List

- 1. Requisition through the recorder maps and enlargements from the forest headquarters or the regional office.
- 2. Prepare daily fire map 2" or 4" scale. This map must be available for fire boss's conference by 8:00 p.m. or earlier.
- 3. Prepare duplicate copies of fire map for division bosses, sector bosses, foremen, scouts, and other personnel as requested.
- 4. Prepare map daily showing communication set-up.
- 5. Prepare daily organization charts and provide copies as requested.

Communication Assistant

<u>Duties:</u> The communication assistant is responsible to the scouting boss. The duties of the communication assistant are to head up all communication work, including telephone and radio. He will see that all necessary communication is provided for the area immediately surrounding the fire, between the fire camps and the forest stations, and with outside commercial facilities.

Reminder List

- 1. Determine telephone and radio needs. (Put on chart).
 - (a) Fire headquarters to line camps.
 - (b) " " outside.
 - (c) " Weather Truck.
 - (d) " ground scouts.
 - (e) " R. O. and equipment caches.
 - (f) " airport.
 - (g) " airplane.
 - (h) " lookouts.
 - (i) Necessary relays for ultra-high frequency radio net.
- 2. Prepare call schedules on a 24-hour basis, if necessary, for:
 - (a) Headquarters operators.
 - (b) Ground scouts.
 - (c) Line camp operators.
 - (d) All other operators.
- 3. Check with telephone boss and radio boss to see that work is running smoothly. (See duties for telephone boss and for radio boss).
- 4. Check currently on (1) condition of equipment, (2) technical operation, (3) regulation of networks, (4) adequacy of supplies and (5) operators.
- 5. Train or provide training for operators.
- 6. Keep abreast of current activities, be prepared to furnish communication for any anticipated position or an emergency and to regulate communication traffic so all bottle necks will be eliminated.

Telephone Boss

<u>Duties</u>: The telephone boss will be responsible to the communication assistant for the installation and maintenance of emergency lines, switch-boards, local phones and commercial connections. He will supervise telephone operators. He will also furnish the communication assistant a map or chart showing the telephone connections and facilities and will revise chart as changes are effected.

Reminder List

- 1. Check with forest or local personnel to secure data on existing facilities.
- 2. Check with communication assistant regarding additional facilities.
- 3. Install switchboard for local camp extensions where facilities do not exist or are inadequate. Keep telephone directory in plain view.
- 4. Secure aid such as lineman and operators; local lineman with knowledge of the system preferred.
- 5. Train telephone operators to be polite and tactful, yet firm; to copy messages in duplicate with the word "Telephone" written across the tops.
- 6. Schedule telephone operator time.
- 7. Check method used in regulating traffic and take steps to assign priority to calls and messages consistent with conditions.
- 8. Check with communication assistant when lines are overloaded to see if relief can be effected by radio.

Radio Boss

<u>Duties</u>: The radio boss is responsible to the communication assistant for the rapid <u>accurate</u> transmission and reception of official communication in order of its priority, the efficient installation, care, operation, control and regulation of radio channels terminating at the headquarters camp or elsewhere as directed, and the correlation and utilization of outside facilities which may be of value to the organization.

The number of operators will depend on the channels employed and the hours of operation.

Except for emergency repairs, all headquarters and field equipment in need of service will be repaired by the night operator during slack periods after midnight.

Reminder List

- 1. Set up headquarters equipment temporarily to contact:
 - (a) Existing forest network.
 - (b) Regional office, if necessary.
 - (c) Weather stations.

(See officer in charge for temporary site).

Improve installation or move to planned site. Traffic must flow uninterrupted during this period.

Maintain headquarters equipment and operating position in A-1 shape at all times.

Service generators regularly.

Maintain order on all networks, using businesslike procedure. Report incorrigible operators to communication assistant.

Complete all schedules set up by communication assistant. Report currently any failure to do so.

Copy all fire weather forecasts without fail. Rebroadcast to division bosses if directed.

Regulate traffic in order of its priority.

Learn and use rules pertaining to messages.

Balance traffic and operating loads, utilizing all facilities at your command.

Aid Weather Bureau mobile unit in the collection of weather reports.

Maintain and broadcast frequently the correct time.

Inform the operator relieving you of any new schedules, changes, or important items or details left unfinished.

Assist the communication assistant, as directed, in planning and arranging for line camp facilities and operators.

Reminder List for Line Camp Radio Operators

Report to the forest officer in charge and arrange for a suitable area for the location of your station.

Make temporary installation and contact the headquarters camp immediately.

Improve the installation without interrupting traffic.

Guard your set from all damage such as:

- (a) Weather.
- (b) Pack stock.

III-3-14

- (c) Packages dropped from airplanes.
- (d) Improper battery connections -- replace cells one at a time.
- (e) Tampering, either by yourself or others.
- 5. Avoid discussing any message handled or overhead with anyone except the forest officers in authority.
- 6. Secure daily from the officer in charge a list of overhead in the area and post near your set.
- 7. Make a map of your communication network and post near set.
- 8. Use loudspeaker judiciously.
- 9. Keep original copies of all messages.
 - (a) Bind daily file together and label.
 - (b) Turn in all messages to the headquarters camp addressed to the recorder when you are released.
- 10. Deliver all messages promptly and secure the initials of the addressee.

 In case of his absence, the officer in charge should initial message.
- 11. Inform originating station of any message undelivered. Write in action taken.
- 12. Advise the headquarters camp as to battery and other needs well in advance.

Radio Operating Procedure

The following statements relating to the operation of radio stations are for guidance in effecting an efficient network with the least confusion and the most rapid accurate flow of traffic:

- 1. Be accurate first and always!
- Reduce the time spent in calling a station, being consistent with transmitting conditions. After contact is made, do away with all calling for the duration of that contact.
- 3. Use the location of the station called and your location in preference to call letters.
- 4. Pronounce and then rapidly spell each word as a means of regulating the receiver's capacity to legibly copy the message.

Inform the station called of the business at hand.

Receipt each message with the rapid rereading of its contents.

Meet all schedules promptly. Maintain an accurate timepiece.

Do not use Q signals or other special procedure when in contact with stations operated by persons unfamiliar with these devices.

Do not change the wording or attempt to interpret the meaning of any message.

Obey the laws regarding the secrecy of messages.

Learn and use the rules pertaining to messages.

Make no comments on the air regarding the activities of the organization unless requested to do so by an officer in authority.

Confine all operation to strictly official business.

Aid the fire boss and other important overhead in the manipulation of the equipment when it is necessary that they contact directly with other personnel in organization work.

Discourage direct conversations over the air except those of important overhead.

Do your part in reducing all interference to a minimum.

Communication Networks

The communication networks shown may be used on large fires. Varians should be used to fit the needs of any specific organization or availlity of equipment. They are:

Fire frequency net operating on 3085 k.c. to be the general regional fire administration channel. (Forests may in many cases use their own frequencies). Its principal uses will be between the base camp and line camps, airport and aircraft, packer and spike camps, and special assignments. Scouts will use this channel when they come in contact with the line stations when their type S sets are unsatisfactory from that position.

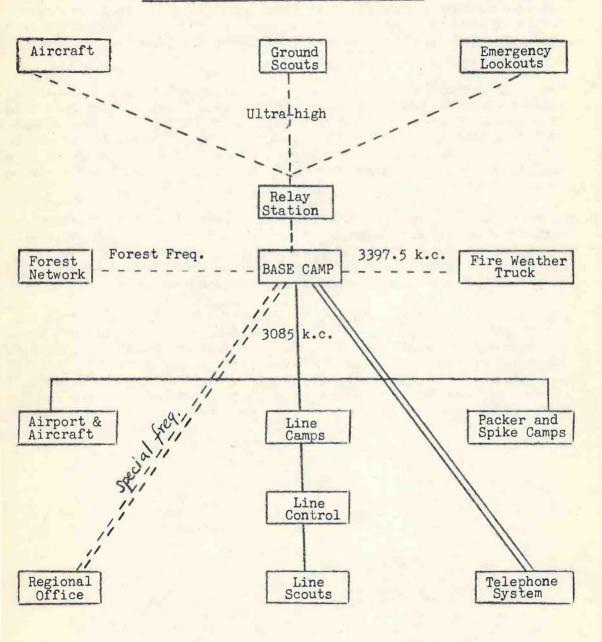
Ultra high frequency network using S, SV, and T sets will be the principal channel used by scouts in reporting to headquarters and for emergency lookouts in the fire area. It will also be used to supplement the telephone lines when overloading is serious. Aircraft will utilize this channel when sufficient ground stations exist to give good coverage. Relay stations should be established on prominent points when the topography will

not permit direct contact between the base camp and the field stations.

- 3. The telephone system will make use of existing forest and commercial lines and such additions as emergency lines and switching stations as the conditions warrant. Normally an emergency line in excess of ten miles should not be constructed when radio is found satisfactory. Route messages not requiring personal conversation between the sender and the addressee by radio whenever possible, reserving telephone for important person-to-person contacts.
- 4. Forest frequency network. A close correlation of radio communication between the forest network and other nets should exist. The base station should be capable of transmitting and receiving on either the fire or forest frequency and act as a clearing house for traffic between the nets. A standby receiver will be maintained at the base camp for intercepting calls on the forest frequency when the fire frequency is being used.
- 5. Fire weather channel. 3397.5 k.c. will broadcast weather forecasts at regular intervals and be used for the collection of weather reports. Schedules of operation should be set up and executed. Care must be exercised in the location of this station to avoid mutual interference to itself and the fire net operating on adjacent channel.
- 6. Regional office channel. When commercial facilities do not exist or are overloaded, a special radio channel between the fire control head-quarters and the regional office may be placed in operation if needed. It should operate without interference with the other networks at the base station to avoid sharing operating time. This is only necessary when a large volume of business is being done between the fire and the regional office.

Sample

Communication Network - Large Fires



FIRE CONTROL HANDBOOK REGION 6



PART III SUPPRESSION

CHAPTER 4
SERVICE OF SUPPLY

SECTION 4

LARGE FIRE OVERHEAD TRAINING

LARGE FIRE OVERHEAD TRAINING

1. INTRODUCTION

Large fire overhead training is necessary for the following key reasons:

- 1. To insure that large fire overhead know the duties and responsibilities of their fire assignment.
- 2. To insure that fire overhead understand their jobs in relation to other overhead jobs so that they can work as an efficient team.
- 3. To train in special fields needing the attention of large fire overhead.

(The training plans for large fire overhead are geared to the above objectives. Experience has shown that <u>continuous</u>, wise training for large fire overhead is needed.)

Basic references are:

- 1. R-6 Fire Fighting Overhead Notebook.
- 2. R-6 Fire Control Handbook.
- 3. List of Training in Appendix, Chapter I, R-6 Training Handbook.
- 2. LARGE FIRE OVERHEAD ORGANIZATION AND TEAMWORK TRAINING, DOWN TO AND INCLUDING THE DIVISION BOSS.
- 3. INSTRUCTION TRAINING PLANS FOR LINE AND STAFF POSITIONS, LARGE FIRES.
 - 3.1 Crew Boss
 - 3.2 Sector Boss
 - 3.3 Division Boss
 - 3.4 Line Boss
 - 3.5 Plans Chief
 - 3.6 Service Chief
 - 3.7 Safety Officer
 - 3.8 Fire Boss

. INSTRUCTION TRAINING PLANS FOR KEY SERVICE CHIEF STAFF POSITIONS, LARGE FIRES.

The following are responsible to the Service Chief:

- 4.1 Camp Boss
- 4.2 Air Officer
- 4.3 Communications Officer
- 4.4 Equipment Officer (Transportation Boss)
- 4.5 Supply Officer

INSTRUCTION TRAINING PLANS FOR KEY PLANS CHIEF STAFF POSITIONS, LARGE FIRES.

The following are responsible to the Plans Chief:

- 5.1 Information Officer (Scouting Boss)
- 5.2 Financial Adviser

SPECIAL INSTRUCTION PLANS

- 6.1 Blowup conditions and safe practices for the Fire Crew Boss.
- 6.2 Ranger District organization for "two-sector" fires.

CHAPTER I - FIRE CONTROL TRAINING - SECTION 4

LARGE FIRE OVERHEAD TRAINING Part 6. Special Instruction Plans

				Co	nten	ts_												Page
6.1		LINE FOR									V T	R	ECC	OGN	ΙΙΖ	Έ		
		ntroducti																
		ire Behav																
	3 I	ndicators	s of Un	usual	Fire	e Be	hav	rior	(B1	.ow	ıps) .		0	0	a	0	9
		afe Pract																
	5 R	eferences	3	a o o		9 0	٥	0 0	0 0		•			٠	0	g	0	15

1 INTRODUCTION

The purpose of this large fire overhead training outline for the Crew Boss is to let him know more about blowup conditions and safe practices to use. This training outline should be used for training both the cooperator and Forest Service Fire Crew Boss. We must assume leadership for training all of our Fire Crew Bosses.

Blowup fires and safe practices to follow have always plagued the Crew Boss. The importance of the problem has again been pointed out by fire accidents during the past several years. There is a need for practical, clear, concise instructions to the Crew Boss on this subject. As a start, the best available information has been listed and recorded in this outline for Region 6 personnel.

For training purposes, a blowup condition is defined as an unusual, explosive, violent fire behavior which is difficult to identify before it occurs.

This training outline is organized in the following main parts:

- l. Instruction steps and key points to stress in Fire Behavior Fundamentals.
- 2. Instruction steps and key points for indicators of unusual fire behavior (blowups).
- 3. Instruction steps and key points for the Crew Boss to follow for safe practices.

It is extremely important that the instructor use all experiences that can be brought to the attention of the Crew Boss to point out the key points and principles outlined in this training plan.

As a matter of interest the following is a quotation by Chief McArdle which points out his thinking on this subject of safety in firefighting:

"We all realize that fighting a forest fire is dangerous. It can't be made a soft job. Despite that fact, or because of it, we must assure every precaution to guard the safety of those who take on this tough assignment. Human life must never knowingly or carelessly be subordinated to other values."

For those who wish to go deeper into the scientific reasons underlying these simple, clear instructions to the fire Crew Boss, a reference list is included at the end of this report.

It is recommended that a minimum of four hours be given each year to the Fire Crew Bosses on the subject of blowup conditions and safe practices.

To make most effective use of this training outline, a fire table demonstration should be used to point up the instruction and key points that are listed.

2 FIRE BEHAVIOR FUNDAMENTALS (The material in this part was obtained from a number of sources, including the Region 4 outline for a one-day fire training school.) Time: 1 hour

Example of Introduction: Successful firefighting is based upon the knowledge of why a fire burns and what makes it spread. Fire is simply a rapid chemical combination of fuel, heat and air. The basic principle of fire suppression is to remove one or more of these elements in the quickest and most effective manner. In order to do this, however, there must be some knowledge of the causes and reasons for fires acting as they do. The primary factors that influence the spread of forest or range fires are fuel, weather and topography.

Fuels: Fuels are commonly divided into two main groups:

- 1. Flash fuels such as dry grass, dead leaves, tree needles, brush and small bushy trees.
- 2. Slow burning fuels such as logs, stumps, deep duff.

Weather: Weather factors with which you as a fire crew boss will be concerned are wind, moisture, and to a lesser degree, temperature.

Slope or Topography: Slope greatly affects the spread of fire in two major ways:

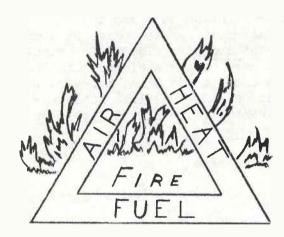
- 1. Preheating
- 2. Draft

Judgment is the major factor in determining the relative importance of all the elements which determine fire behavior. For example, continuity and arrangement of fuels are sometimes more important than volume. Given a certain volume of fuel, features of arrangement or position will influence spread as well as difficulty of control. If fuels are patchy, broken up by areas of thinner fuel, rocky or barren spots, the spread may be uneven and slow. If these same fuels are partly on the ground and partly in the air - standing snags - spread may be by spotting, and with severe winds, this may cause a most difficult fire. It pays to look carefully at all conditions in sizing up a fire.

The fire crew boss must take advantage of known methods of sizing up a fire at a given time and predicting what will happen as the fire advances or as changes of weather occur. Now we will look into the fundamentals of fire behavior you should know as a Fire Crew Boss.

Instruction Steps

1. fire triangle.



2. Concentrated fuels burn faster.

(Note: The rire Table or appropriate slides should be used to illustrate key points)

- 1. (a) The first basic principle of fire control is to break the triangle.
 - (b) Discuss various ways in which the fire triangle may be broken.
 - (c) The <u>ease</u> of ignition and <u>rate</u> of combustion are determined by the amount of heat, the available oxygen and the type of fuel.
 - (d) Actual heat requirements for ignition of forest fuels varies very much. Normally the finer the fuel, the shorter the ignition time.
 - (e) The most common method of fighting fire is based on the principle of producing a gap between the fire and the fuel.
 - (f) Grass is more than three times as ignitible as timber fuels.
- 2. (a) A loose pile of fuel ignites more easily than a tightly packed bundle.
 - (b) Volumes of fine dead wood ignite very easily and the fire rapidly develops tremendous heat.

R-6 Training Hdbk. Page Added 3-20-56 No. 4

- (c) Concentrations of fuels on the ground under trees is especially troublesome. The hot air masses transfer a large amount of heat to the tree crowns and bring them nearer to the ignition temperature.
- (d) A pile of logs creates a hot fire because the burning logs radiate heat to each other.
- 3. Topography influences the direction 3. of fire spread.
- (a) Fires travel faster uphill because the fuel on the upper slope is closer to the source of heat.
- (b) Heat is also carried to the fuel upslope by draft of fire.
- (c) Fire burns up the slope in a wedge shape. Also, drafts are into the fire on both flanks. In application, this permits working the flanks even of a fast running fire.
- 4. Fires burn faster on steep slopes.
- 4. (a) A higher percentage of fires spread to large size on steep slopes.
 - (b) Spotting is always a problem on fast traveling fires.
 - (c) On very steep slopes there is also the effect of rolling material on the spread of fire.
 - (d) Fires on steep slopes tend to be definitely wedged shape.

5. Flames bend back into fire at top of slope.

canyons.

- 5. (a) As a fire reaches a slope summit, the updraft from the opposite side of the mountain will bend flames into the burn.
 - (b) Fire will slow down just over ridge and often can be dirted out, particularly a grass fire.
 - (c) When a fire tops a ridge, there is always the probability of rolling material going down opposite slope and spreading the fire.
- 6. (a) Fuels on the opposite slope 6. Fires easily cross narrow from a fire in a narrow canyon are subjected to intense heat and flying embers.
 - change direction when they reach the zone of the upcanyon air movement. (c) Wind eddies and strong upslope air movement may be

(b) In narrow canyons, wind may follow the direction of the canyon. Fires approaching a canyon on a spur ridge may

- expected at sharp bends in narrow canyons. (d) Shifting winds, violent up-
- slope air movements, spotting, and other erratic fire behavior set up very hazardous suppression action in narrow canyons. Crews going into these situations must be sure to have an escape route well planned out in advance.

Suggested Demonstration Materials and Equipment

Blackboard Paper and easel Chalk, white and colored) Colored crayons Eraser

Kitchen matches One lb. coffee can with small hole in cover

(continued on next page)

R-6 Training Hdbk. Page Added 3-20-56

Fire table

No. 4

I-4-8

Small blow-torch or gas burner Electric fan Blacksmith tongs Canvas, 4' x 4' Gloves

Fuels: Dry grass, pine needles and oak leaves; dry twigs, sticks or branches up to 1" in diameter; green twigs, needles and leaves, small cones.

Slides (Region 4 - set)

3 INDICATORS OF UNUSUAL FIRE BEHAVIOR (Blowups)

Time: 2 to 3 Hrs.

Occasionally a forest fire burns with an intensity that seems far out of proportion to apparent burning conditions. Each blowup fire raises the question: What can we do to recognize conditions causing extreme fire behavior? How can we predict these conditions in advance? The following on-the-ground indicators should be watched for as they may mark extreme burning conditions that will follow:

Instruction Steps

- 1. Be alert to fuel conditions.
- 1. (a) location
 - (b) amount
 - (c) dryness
 - (d) spotting 600' ahead of fire
 - (e) Noise of <u>small</u> or large trees crowning out.

- 2. Weather factors.
- 2. (a) Strong winds blowing.
 - (b) Unexpected calm. May result in winds shifting.
 - (c) High clouds moving fast may result in unusual winds on ground.
 - (d) Any evidence of chimney or mushrooming on own fire or adjacent fire.
 - (e) Unusually high temperatures early in morning.
 - (f) Look for dust devils and whirl-winds. (See extract from Camp Creek Fire Board of Review.)

(Consider these things)



- (g) Thunderheads above or in close proximity to fire usually leads to dangerous downdraft winds. (See Ayer's report, sent to forests, for items g - h - i).
- (h) Dark columns or cores of rain beneath the cloud may or may not be reaching the ground.
- (i) If thunderhead is upwind of the prevailing wind, the danger is greatest.
- (j) When slope becomes shaded, look out for downdrafts.
- (k) If fire is burning near a mountain or glacier (such as Mt. Hood), greater downslope wind velocities will normally occur.
- (1) Keep an eye on smoke column.
 Winds may be blowing from
 different directions above fire.
 This could result in spot fires
 outside.
- (m) Time of day. Blowups usually occur between two and four P.M.
- (n) Watch smoke column for an increase in wind speeds aloft. This leads to <u>spotting</u>, and <u>gusty wind conditions</u> may also result.
- (o) Watch for intense burning inside fire line.
- (p) Smouldering fires over a large area.
- (q) Surface fire drying crown foliage - stage set for reburn.
- (r) Many simultaneous fires starting.

Introduction: The Crew Poss has two main responsibilities:

- To obtain an effective, fair day's work from his crew and
- 2. To look after the safety and welfare of his crew 24 hours a day, to the best of his ability.

You know how to recognize conditions leading to "blowup" fires. Now we are going to share our experiences in knowing what safe practices to:

Know and use to prevent injuries or loss of life during blowup conditions.

(Note to Training Leader)

As you put across the following instruction steps and key points listed below. please:

- 1. Review with Group and stress key points.
- 2. Encourage Crew Bosses to relate actual experiences they have had on a fire to stress key points.
- 3. Relate experiences you have had to illustrate points.

Instruction Steps

STAY ALERT. Be prepared for 1. (a) Heads up: Look Up, Look safe emergency action. KEEP YOUR HEAD.



Key Points

- Down, Look Around.
- (b) See what you look at!
- (c) Know what danger signs to look for, including fatigue. Use your Fire Behavior Know How.
- (d) THINK before Acting.
- (e) Firefighting is dangerous. Crew Boss has a KEY Job. Men are looking to Crew Boss.
- (f) Keep an up-to-the-minute plan of get-away action in mind.
- (g) ACT with decision and promptly when escape action is needed.

R-6 Training Hdbk. Page Added 3-20-56 No. 4 (Be alert like a goose.)



2. Gain Their Confidence.

(Example - Sagebrush Fire)

3. Work and Act as a team.

- (h) Remember a fire line is not safe until it is burned out.
- (i) Remember experience shows that usual blowup time is 2 to 4 P.M.
- (j) The spectacular may not be most dangerous.
- (k) If in especially dangerous spot, such as brush fires, get a radio.
- (1) Get weather forecast in morning.
- 2. (a) Let your Crew members know you are responsible for their Safety.
 - (b) Need for keeping crew together.

 Use words: "Come Here", "Follow

 Me", "Keep Together". The Crew

 Boss is the leader.
 - (c) Don't assume anything. Crew Bosses have said, "Let's go" and men have gone different directions.
 - (d) Assign most experienced, mature man as scout when in especially hazardous situation.
- 3. (a) Keep crew together. Need to do this for clear, safe actions.
 - (b) Know who all your men are and know where all your men are.

 Don't assume anything!
 - (c) Men must follow all verbal orders and stick together when orders are given to move out.
 - (d) Have men keep hand tools as they may be of value in protecting men.

- 4. Planned Get-Away, including Escape Routes
- (Examples Small stream saved lives in Chetco fire 1938, and Little Chetco fire 1940.)



- (e) Remember danger potential of timber, brush and grass fire-fighting.
- (f) Keep Crew informed.
- (g) Manage your men.
- (a) Crew Boss must always have in mind a clear-cut plan of action for fire "blowups". Know in advance where you will lead crew.
- (b) Keep in mind open places such as rock slides, streams, burned over places, meadows, alder patches and gravel bars.
- (c) One of the safest sopts is burned over area. If needed, dig in.
- (d) When not possible to get into burned area, remember, men can travel faster downhill or along contour.

 Warning Remember, winds usually blow downslope at night and fires can run rapidly downhill.
- (e) If necessary to jump through burning edge of fire, have men place hat or coat over face.
- (f) Caution men: if clothes catch on fire, roll on ground in dirt to put out fire.
- (g) DO NOT travel ahead of fires in direction of spread, unless you are positive safe place ahead can be reached by crew.
- (h) When not possible to get within burn, pick most open ground possible and avoid dense brush. Men become separated and go astray.

- (i) When at safe spot, remember
 Suffocation has Killed. Have
 men keep damp cloths over their
 noses and get next to ground.
- (j) If in heavy brush (ceanothus, chinquapin, live oak) have prepared escape route cut out by hand or machinery.
- (k) After reaching escape spot, check to be sure it is safe from falling trees, snags, rolling logs or rocks. Try to find a safe vantage point and post lookout.
- In any brush firefighting, when working in advance of fire with dozer, build safety strip for retreat.
- (m) In timber types, sharp ridgetops are good bet to get to if possible.
- (n) Watch for safer topography, benches in steep country.
- (o) If in California, keep heliport spots in mind, about 100'x100' in size.
- (p) As last resort, burn out and dig
 in.

5 REFERENCES

- Arnold, R. Keith, and Buck, Charles C. Blowup Fires, Silviculture or Weather Problem? Jour. of Forestry, 52:408-11, June 1954.
- Ayer, Harold S. Meterological Conditions During the Fire Blowup at Seneca, Oregon, September 4, 1955
- Barrows, J. S. Fire Behavior in the Northern Rocky Mountain Forests. U. S. Forest Service, No. Rocky Mtn. Exp. Sta., Sta. Paper No. 29, May 1951.
 - Forest Fires in the Northern Rocky Mountains. U. S. Forest Service, No. Rocky Mtn. Exp. Sta., Sta. Paper No. 28, April 1951.
 - MacCready Jr., Paul B.; Schaffer, Vincent J.; Dietrich, John H. Project Skyfire— Cloud and Lightning Observation Handbook. Misc. Pub. No. 5, June 1955.
 - " Schaefer, Vincent J.: MacCready Jr, Paul B. Project Skyfire—A Progress Report on Lightning Fire and Atmospheric Research.
 Research paper No. 35, November 1954.
- Brown, A. A. Warning Signs for Firefighters. Fire Control Notes, 11(3):28-30, July 1950.
 - Folweiler, A. D. Fire in the Forests of the United States. John S. Swift Co., Inc., 1953.
- Byram, George M. Atmospheric Conditions Related to Blowup Fires. U. S. Forest Service, Southeastern For. Exp. Sta., Sta. Paper No. 35, April 1954.
 - Terrestrial Radiation and Its Importance in Some Forestry Problems. Jour. of Forestry, 46:653-8, Sept. 1948.
 - "Nelson, Ralph M. The Possible Relation of Air Turbulence to Erratic Fire Behavior in the Southeast. Fire Control Notes, 12(3):1-8, July 1951.
- Cramer, Owen P. Recognizing Weather Conditions That Affect Forest Fire Behavior. Fire Control Notes, 15(2):1-6, April 1954.
 - Weather and Forest Fire Behavior. Quarterly of the National Fire Protection Association, Vol. 48, No. 2, October 1954.
 - Forest Fire Danger in Western Oregon and Washington during 1953. U. S. Forest Service, Pacif. N.W. For. and Range Exp. Sta., Res. Note No. 94, Nov. 1953.

- Cramer, Owen P. and Kirpatrick, Robert. Comparative Ratings of 1951 Forest Fire Weather in Western Oregon. U. S. Forest Service, Pacif. N.W. For. and Range Exp. Sta., Res. Note No. 76, Dec. 1951.
- Crosby, John S. The Role of Burning Index in Fire Danger Estimation. Fire Control Notes, 14(2): 10-11, April 1953.
 - Probability of Fire Occurrence Can Be Predicted. U. S. Forest Service, Central States For. Exp. Sta., Tech. Paper No. 143, August 1954.
 - Vertical Wind Currents and Fire Behavior. U. S. Forest Service, Fire Control Notes, 10(2):12-15, April 1949.
- Fahnstock, George R. Relative Humidity and Fire Behavior in Legging Slash.
 U. S. Forest Service, No. Rocky Mtn. Exp. Sta., Research Note No. 126,
 August 1953.
- Fenner, R. L.; Arnold, R. K.; Buck, C. C. Area Ignition for Brush Burning. USDA Calif. Forest and Range Exp. Station, Tech. Paper No. 10, July 1955.
- Fite, Fred M. Fire Weather Forecasts. Fire Control Notes, 14:18-20, January 1953.
- Graham, Howard E. A Fire Whirlwind of Tornadic Violence. Fire Control Notes, 13(2):22-24, April 1952.
 - Fire Whirlwinds. U. S. Weather Bureau, Portland, Oregon.
- Hayes, G. L. Influences of Altitude and Aspect on Daily Variations in Factors of Forest Fire Danger. U.S.D.A. Circular No. 591, 1941.
- Keetch, John J. Instructions for Using Forest Fire Danger Meter, Type 8.
 Southeastern For. Exp. Sta., Sta. Paper No. 33, January 1954.
- McCarthy, K. R. Fire Weather Ahead. Amer. For., 59(7):10-12, 40-41, July 1953.
- Mattsson, J. Wayland. Outline for One-Day Training School on Safety and Fire Behavior. Region 4.
- Syverson, Charles E. Further Comments on Downdrafts from Thunderstorms.
 Missoula, Montana.
- U.S.D.A. A Training Course in Fire Behavior. R-5, 1950.

Forest Firefighting Fundamentals. Not dated.

" Forest Service Safety Code.

Mann Gulch Report of Board of Review. August 5, 1949.

" Organization for Forest Fire Suppression.

The Rattlesnake Fire Board of Review. July 9, 1953.

R-6 Training Hdbk.
Page Added 3-20-56
No. 4

FIRE CONTROL HANDBOOK

Region 6

U. S. FOREST SERVICE

Part III

SUPPRESSION

Chapter 4

SERVICE OF SUPPLY

PART III - SUPPRESSION - Chapter 4

SERVICE OF SUPPLY

Table of Contents

	Page No.
Introduction	III-4-1
Service of Supply Organization	III-4-1
SOS Positions Defined	III-4-3
Fire Camp Planning	III-4-4
Camp Location	III-4-4 III-4-4 III-4-7
Receiving, Organizing and Dispatching Crews	III - 4-9
Receiving Men and Organizing Foreman Crews	III-4-9 III-4-9 III-4-11
Messing	III-4-11
Kitchen Arrangement Kitchen Equipment Central Kitchens Meals	III-4-11 III-4-11 III-4-12 III-4-12
Subsistence Supplies	III-4 -1 3
Size of Stock in Fire Camps	III-4-13 III-4-13 III-4-13 III-4-14 III-4-15
Tools and Equipment	III-4-15
Source of Supply Ordering from Interforest Caches Receiving Storage Tool and Equipment Distribution Preventing Losses Returning Tools and Equipment to Caches Renting Equipment Maintenance	III-4-15 III-4-15 III-4-15 III-4-16 III-4-16 III-4-16 III-4-17 III-4-17

Table of Contents (Cont.)

	Page No.
Transportation	III-4-17
General Planning	III-4-17 III-4-17 III-4-18 III-4-18
Communication	III-4-18
Records and Reports	III-4-19
Progress of Fire Report Record of Liabilities Daily Activity Record Property Accounting	III-4-19 III-4-19 III-4-20 III-4-21
Sanitation	III-4-21
Kitchen Water Supply Garbage Latrines Washup Station Bed Grounds	III-4-21 III-4-22 III-4-22 III-4-22 III-4-22 III-4-22
Safety and First Aid	III-4-23
Camp Fire Safety Officer Transportation Fire Precautions First Aid Compensation for Injury	III-4-23 III-4-23 III-4-23 III-4-24 III-4-24 III-4-24
Commissary	III-4-25
When Necessary Procedure for Purchasing Authorized Items Procedure for Selling Accounting Storage in Camp Transfer Between Camps Closing at End of Project	III-4-25 III-4-25 III-4-26 III-4-27 III-4-27 III-4-27 III-4-27

Table of Contents (Cont.)

•	Page No.
Employment	III-4-28
Hiring Firefighters	III-4-28 III-4-29 III-4-29
Time Recording	III-4-32
Keeping Record of Time in Camp Keeping Time on the Line Transferring Men to Other Camps or Fires Overhead From Other Forests Submission of Time Reports for Payment Use and Interpretation of Fire Time Report Return Transportation for Men Payment of Wages in Cash	III-4-32 III-4-33 III-4-33 III-4-33 III-4-34 III-4-37 III-4-37
Demobilization	III-4-38
Reminder List	III-4-38
Appendix (Table of Contents)	III -4-3 9

SERVICE OF SUPPLY

Introduction

The purpose of this chapter is to present approved methods and procedure for employing men for fire suppression, establishing and managing fire camps, maintaining adequate stocks of supplies, tools and equipment, and keeping fire camp accounting records. The term "Service of Supply" has been expanded to include the organization necessary for handling all of these activities.

The successful handling of a large fire depends to a considerable extent upon efficient functioning of the service-of-supply organization. This organization is just as important as the forces employed on the control line. The latter cannot function effectively without adequate equipment, plenty of wholesome food, and well-managed bases in which to rest when off shift. Their time must be kept correctly and every detail of the camp activities must be planned and carried out in an efficient manner so that the fire boss will be able to devote the maximum amount of his time to management of the control-line organization.

The position of camp boss embraces large responsibilities. The actual scope of his work is determined by the fire boss (or division boss) in each individual case. Ordinarily he has charge of all camp activities in one fire camp. In small camps the camp boss may personally handle nearly all activities, but in large camps he will find it necessary to select assistants to handle certain jobs or groups of jobs. *-Such assistants may be designated equipment officers, transportation officers, timekeepers, or similar specialists.-*

On large fires where it is necessary for the fire boss to have help in coordinating the activities of camp bosses and all service-of-supply functions, *-a service chief-* may be employed. He is responsible to the fire boss and has indirect supervision of camp bosses in several camps. He is usually a yearlong forest officer of wide experience and organizing ability.

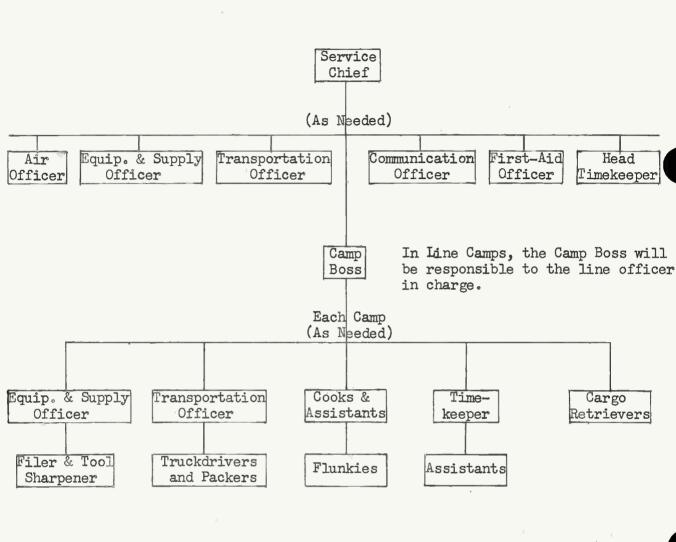
The following instructions are intended to systematize and simplify service-of-supply functions (This chapter will also serve as a textbook for training purposes and as a ready reference in the fire camp):

Service of Supply Organization

The service of supply is responsible for establishment and management of camps or bases, supplies and equipment, feeding, commissary, first aid, sanitation, transportation, timekeeping, and other records.

Personnel employed on service-of-supply activities should remember at all times that the purpose of the entire fire organization is to control and put out the fire in the shortest possible time. Everything else is subordinate to this objective. Every act of the SOS personnel should be planned and carried out with this objective constantly in view.

Service of Supply Organization for Large Fires



R-6 F.C. Hdbk. Entire Page Amended 7-26-54

No. 85

SOS Positions Defined

Service Chief: Works under the supervision of the Fire Boss and in close contact with the Plans Chief.

Is responsible for furnishing all facilities and services called for in the plan of control for the fire. Such services and facilities to include Communication, Transportation, Supply and Camp Management in the proper amounts and at the proper time and place. This includes:

Personnel fed, rested and segregated by units for rapid dispatch. Provision for first aid facilities.

Tools sharpened and segregated.

Vehicles serviced and manned by qualified drivers.

Specialized equipment serviced and manned by qualified operators.

Establishes, maintains and operates fire camps; assigns and supervises personnel needed to operate the camps, will ordinarily select camp locations according to plan, but in absence of such a plan, will independently plan the camp locations needed for proper service of line personnel. When independent plan is made, review by Fire Boss or Plans Chief will precede establishment of camps.

Secures men, tools and specialized equipment as requested by the Plans Chief or Fire Boss. Anticipates requirements in general terms. When given a manpower and overhead list, will independently determine rations, bedding, commissary, and transportation requirements and obtain or have such items immediately available. Is responsible for keeping such supplies available and ready for use as called for. Sees that purchase orders are issued for all purchases and that contracts of hire are made for all equipment hired.

Obtains, services, and operates a transportation fleet to transport men, supplies and equipment. The size and character of the fleet are ordinarily determined by the Service Chief from an analysis of the control plan and anticipation of transportation requirements, based on:

Transportation routes.
Facilities available.
Type of objects to be transported.

Decides mode of transportation, schedule of trips, routing, etc.

Establishes, maintains and operates a communication system in accordance with a Communication Plan developed by the Plans Unit that will provide continuous service for:

The Plans Unit and its field personnel.

The line organization.

Service Chief and his outposts.

Fire headquarters and the behind-the lines agency.

Special needs such as planes, tractors, etc., as determined to the such as planes.

Special needs such as planes, tractors, etc., as determined by the Fire Boss and stated in the plan of control.

R-6 F.C. Hdbk. Entire Page Amended 7-26-54 Will anticipate normal Service needs on the basis of the organization, personnel, and location of probable control line. Refinements will be based on approved control plans.

In addition to the stated requirements of manpower, tool, equipment and facilities, independently calculates the anticipated attritional losses of the particular fire and requisitions and distributes the items needed to maintain the quantity of control resources at the proper level.

Upon receipt of the planned line organization, organizes and dispatches crews and equipment in accordance with instructions. Is responsible for the line forces until delivered to the place and/or person called for in the instructions.

Specifically he:

Determines the personnel and organization requirements of the Service Unit. Gives special consideration to reduction of subordinates when job requirements are being reduced.

Determines time required for mobilization of resources.

Determines time required for distribution of control resources from base key points on line and adjusts camp routine to absorb this time element.

Determines source, quantity and type of unobligated control resources available for assignment to the operation and keeps this information currently summarized and Plans Unit notified.

Maintains contact with secondary camps (line camps) and sees that they efficiently and completely serve line forces.

Determines through consultation with Headquarters Dispatching Unit and the Fire Boss a priority of release for manpower and equipment. As surpluses become evident, organizes and dispatches to their destination.

Determines replacement needs of men, overhead, equipment and supplies and takes necessary steps to have available as needed in accordance with plans of the Plans Unit.

For each basic item requested (groups of men, equipment, mules, etc.) determines and obtains the supplementary items necessary to make the item a sustained operating unit.

Supervises the work of the Equipment Officer, Supply Officer, Communication Officer or Camp Boss. In their absence or prior to their arrival, must perform the duties of the position.

Sees that accepted safety practices in camp set—ups and transportation facilities are followed:

Sees that adequate <u>first aid facilities are available</u> in camps and on the line.

R-6 F.C. Hdbk.
Page Added 7-26-54
No. 85

Assists Plans Chief in the development of the demobilization plan and executes the Service Sections of such plan. This plan includes safe transportation of personnel and equipment to their home bases.

Outlines and supervises the timekeeping job. Sees that timekeepers maintain time records of all personnel and special equipment. Sees that the pertinent parts of this information are provided the Plans Unit.

Note: Service Chiefs are usually employed on all fires above the Two-Sector size.

Equipment Officer (Equipment Boss): The Equipment Officer is responsible to the Service Chief for the overall coordination and management of machines and livestock assigned to the fire. This will normally include personnel and supply-carrying vehicles, heavy transports, tractors, power saws, tankers, and pack stock. Depending upon the total job load involved, he may have assistants directing, but responsible to him in directing one or all of the following services: tractors, ground transportation, pack stock, saws or tankers. On fires requiring a Two-Division fire or larger organization, a transportation officer usually is essential if large numbers of privately-owned transportation equipment are being used.

Specific duties are:

Determines need for special assistance if any required such as transportation officers, service units (mechanics, "lubers", etc.), relief tractor operators, packers, machine expediters, etc., and takes action through the Service Chief to secure them.

On the basis of items requested to be transported within specific time limits, determines the type and amount of transportation equipment needed, and sees to it that all of it gets to the right place at the right time, and in good working order.

Determines the number of personnel, drivers, mechanics, packers, etc., needed for operation and maintenance of machines and pack stock.

Organizes and supervises subordinate personnel.

Maintains current summary of machines showing type and location, and makes this information currently available to the Plans Unit.

Arranges for the service and maintenance of all machines and livestock, including bulldozers, power saws, tank trucks, trucks, horses, etc. Sees that all equipment is covered by contract.

Determines the supplies (gasoline, oil, repair parts, forage, saddles, lubrication units) needed to maintain the machines and pack stock in safe and efficient operating condition and sees to it that they are available on the job. Arranges with Supply Officer for most expeditious ordering.

Selects and posts, where necessary, the best and safest transportation route to key points on the fire (will check scouting information to determine how much independent work is necessary).

Establishes traffic controls to prevent congestion or accidents.

Prepares traffic schedules which will permit most economical use of transportation equipment.

Turns in time of packers, truckdrivers, mechanics, etc., working under him, to timekeeper and checks classification to be sure they are correct.

Equipment and Supply Officer: Is responsible to the Service Chief for obtaining and distributing all items called for in the plan for control of the fire and with the exception of those duties assigned to the Camp Boss, the Transportation Officer and the Communication Officer, of maintaining them in working condition.

Specific duties are:

Keeps current summary of the location of all items other than personnel and heavy equipment, assigned to the fire. Works in close contact with the Maps and Records Officer.

Checks all orders for completeness; determines need for supplementary items. Maintains adequate stock of essential foods and other items.

Places all orders with supplying agency and/or procures locally in accordance with established procedures. Sees that purchase orders are issued for all purchases made by him.

Establishes time limits and schedules for placing of orders for the various classes of items used and notifies persons responsible for originating orders.

Determines availability of items that may be needed in control of the fire.

Maintains tools and small equipment and assembles by logical line unit for issue each shift. Establishes and maintains a system of accountability.

Determines commissary (tobacco, socks, etc.) needs, procures and arranges for issuance by the timekeeper.

Determines the replacement rate for all items except communication and transportation, and after approval of Service Chief, secures such replacement.

Organizes and supervises subordinate personnel.

Obtains adequate supply of safety equipment, such as stretchers, hard hats, first aid kits, truck seats, tool guards, etc.

Note: Equipment and Supply Officer used on Two-Division and higher fire organizations only.

R-6 F.C. Hdbk.
Page Added 7-26-54
No. 85

Communication Officer: The Communication Officer is responsible to the Service Chief for establishing, maintaining and operating the communication facilities.

Specific duties are:

Determine's equipment (type and amount) required to meet communication requirements established by the Plans Unit for the job. Arranges with Supply Officer for most expeditious ordering.

Determines personnel needs - technicians, operators, messengers, and guides.

Determines repair and replacement needs (crystals, tubes, telephone line, batteries, etc.) arrange with Supply Officer for most expeditious ordering.

Installs, maintains and operates communication facilities in accordance with Communication Plan proposed by the Plans Unit.

Prepares schedules to meet requirements of the control plan within the limit of available resources.

Maintains record (map and chart) of location of equipment.

Independently works out and suggests improvements to communication system.

Organizes, trains and supervises subordinate personnel.

Reviews communication and safety needs with Line Staff Officers.

Establishes message center at base camp through which all messages are sent, received, and recorded.

Camp Boss: Is responsible to the Service Chief when one is employed, or to the Fire Boss when not employed, for the establishment and operation of a base of operation. Is furnished with the location, general requirement and time schedule of the particular base.

Camp Bosses of Line Camps are directly responsible to the Division or Sector Boss depending on whether a Division or Sector Line Camp.

Specific duties are:

Plans the detailed layout and sets up the base.

Organizes and supervises subordinate personnel.

Specifically designates and makes assignments to sleeping areas. Sleeping areas to provide for proper segregation of personnel, safety, quiet and maximum amount of shade for day sleepers. Special consideration should be given to safety in selecting day bedding grounds in air drop camps. All bedding grounds should be roped off or isolated to eliminate any possible danger from tractors and trucks.

Sees that men are provided with proper sanitary facilities within the limits of available resources.

Provides for a safe water supply.

Organizes and schedules the feeding of personnel (including lunches) to meet the requirements of the control plan.

Establishes warming fires, bulletin board and similar facilities as needed.

Establishes and operates a first aid station for treatment of minor injuries. Arranges for treatment of more serious cases by a regular physician preparing necessary forms, etc.

Prepares instructions for Crew Bosses governing their camp responsibilities, time schedules and camp routine while in camp.

Determines supply and personnel requirements for the camp management unit.

Organizes and mobilizes personnel for assignment in accordance with the plans for the shift. Actual dispatch of crews will be done by Service Chief when one is employed.

Reports time of camp help to timekeeper and checks to be sure they are properly classified.

Is responsible for clearing and keeping aerial drop area clear of personnel while dropping is being done.

Handles routine Service work up to and including the Two-Sector fire.

Note: Camp Boss used on all fires of Multiple Crew or higher fire organizations.

Air Officer (Air Operations Boss): Where one or more aircraft are used on a fire, a qualified employee shall be designated as Air Officer. He is responsible to the Service Chief or Camp Boss if no Service Chief is employed and is in charge of planning, establishing and maintaining the performance standards of the aerial phases of the specific operation in conformity with pertinent regulations and instructions in the U.S.F.S. Air Operations Handbook. In a complete aerial operation, assignment of assistants may prove necessary.

His duties include:

Helps plan daily use of aircraft.

Coordinates all cargo dropping, reconnaissance and transportation of personnel.

Assigns ships and personnel.

R-6 F.C. Hdbk. Page Added 7-26-54 No. 85 Schedules all flights and flight missions.

Establishes priorities.

Briefs personnel each day on:

Type of missions to be flown.

Landing points to be used.

Schedule to be maintained.

Weather and smoke conditions.

Hazards such as power lines.

Safety.

Maintains necessary records.

Advises local airports that private aircraft should stay out of hazardous zones during air operations.

Constructs and maintains heliport:

Provides adequate clearance for approach, landing and takeoff.

Installs streamer to indicate wind.

Wets down landing spot if necessary.

Service:

Checks with operators on supplies available for operation.

Consults with Supply Officer for most expeditious ordering plan.

Safety:

Ensures full compliance with good safety practices and regulations by thorough investigation and prompt corrective action of any unsatisfactory operational component.

Helicopters:

Keeps unauthorized personnel away from heliport.

Trains personnel to approach, enter and leave ship properly.

Equips helpers with goggles.

Checks on proper loading and unloading of personnel and cargo.

Grounds ship during periods of high wind and poor visibility.

Fixed Wing:

Provides cargo dropper with chute and knife.

No loose chutes in plane.

Static line on all cargo.

Safety strap across door of plane if needed.

Cargo packed properly.

Notifies Camp Bosses when drop will be made in order for drop area to be marked and cleared of personnel.

Note: Employ only as needed.

-First-Aid Officer- Responsible for maintaining first-aid supplies and equipment and qualified for performing first-aid duties. Works under the *-Service Chief-* at the fire headquarters or under the camp boss in a line camp. He will see that compensation-for-injury forms are completed. The fire safety officer will complete the accident-investigation form and assist the first-aid man in completing other forms. (See Safety and First-Aid Section.)

-Transportation Officer-: Responsible for transportation facilities and works under the *-Service Chief-* at the fire headquarters or under the camp boss in a line camp. He controls traffic, schedules trips, directs the work of truckdrivers and packers, and is responsible for maintaining and servicing all transportation equipment *-including testing of brakes on government equipment and private equipment used for hauling men.-* In small camps this job is usually combined with that of the *-Equipment and Supply Officer.-*

Head Timekeeper and Paymaster Assistant: Where large numbers of outside help are employed a yearlong officer, authorized to pay the men as they are discharged, will work under the *Service Chief-*. He will be assisted by clerks and bookkeepers as necessary. During the early stages of such a fire, there will not be much demand for a heavy payoff of laborers. During this period, this officer will be responsible for helping the camp bosses in organizing, coaching and supervising the timekeeping staff on the fire. He will be responsible for obtaining accurate and complete time records from the various camps. To the extent that this part of the work is adequately done, the final payoff will be simplified by the absence of errors and confusion in time reports. When the payoff comes, the timekeeping staff should be so organized and functioning that it will require but little supervision. This officer also will supervise and arrange for the necessary contracts of hire, compensation forms, and other fiscal records.

-Timekeeper: In fire camps of over 25 hired firefighters, the camp boss is usually assisted by one or more timekeepers. The timekeeper, under the direction of the camp boss, may handle the commissary.-

Fire Camp Planning

Camp Location

The selection of the general location of the camp will be made by the fire boss or his designated representative. Ordinarily the *-Service Chief-* will choose a specific site and plan the camp after the general location has been made known. Small camps should be the rule. Camps should not contain over 200 effective firefighters. Important points to consider in choosing the location of a fire camp are:

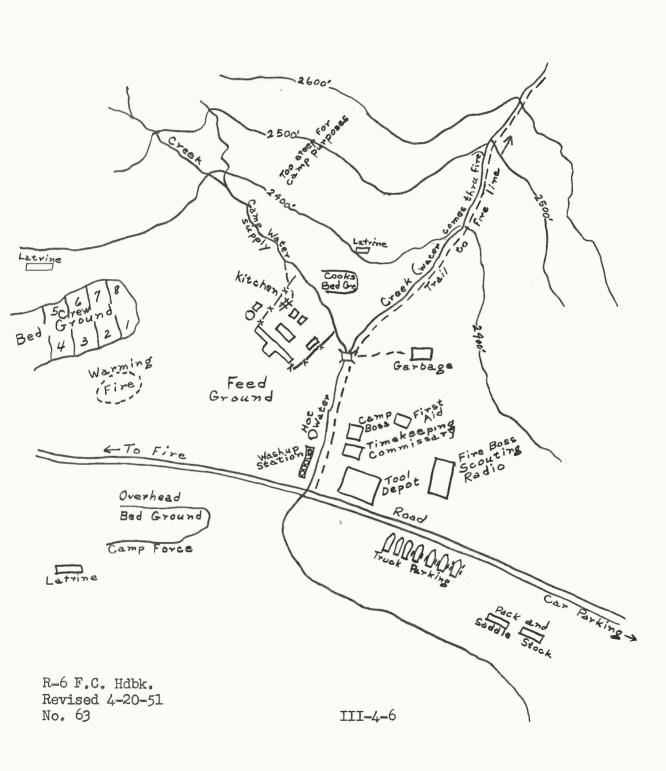
- 1. The camp must be as close as possible to the fire, consistent with transportation, water supply and space requirements, so as to conserve time and energy for control-line production.
- 2. It must be safe so that the men will be in no danger from the fire itself from natural hazards such as rolling rocks or falling snags.
- 3. The site must be readily accessible for delivery of supplies and equipment by truck, pack animals, tractor or airplane. Hot food can be dropped by airplane or otherwise transported from a central kitchen so that refined cooking facilities will not always be necessary. Likewise, water can be transported to fire camps, especially on roads.

Camp Layout

Camps must be arranged to provide smooth functioning of all activities. The location of each facility should be made so as to reduce to the minimum the time required to feed, tool up and dispatch crews. Facilities should be provided for time-saving and efficient operation, but frills and unnecessary polish should be avoided.

The time available for planning a camp is usually very limited. The following material will assist in quickly formulating a plan. A sample fire camp layout is included in this section. The arrangement can be modified to suit conditions. The main points to consider when setting up a camp are as follows:

- 1. On arrival at the campsite, roughly sketch the area indicating:
 - a. Limits of usable ground area.
 - b. Source of drinkable water supply.
 - c. Road or trail into camp and to the fire.
- 2. Indicate, on the sketch and on the ground, location of:
- a. <u>Kitchen</u> Below source of water supply, at least 50 feet from intake. Include area for feeding. All camp facilities should be below source of water supply for kitchen.
- b. Tool Depot At convenient point near road or trail leading to fire.
- c. Timekeeping Station Near entrance to camp where men will enter and leave.
- d. Telephone and Radio Convenient location near fire boss or camp boss headquarters. Radio must be away from camp noise.
- e. Fire Boss, Camp Boss and Scouting Headquarters Away from noise of camp activities.
- f. Truck Parking Near entrance to camp where dust and noise will not reach camp proper.
- g. Bed Grounds Away from camp noise and activities. Ample space for sleeping in crew units. Shady area for daytime occupants. Separate areas for camp personnel and overhead.
- h. Washup Station Away from and below kitchen. Gravity water supply if possible.
- i. First-Aid Station Isolate from service area in shade if possible and convenient to transportation.
- j. Latrines At least 150 feet from any stream and 300 feet from kitchen. Convenient to bed grounds.
- k. Garbage Pit At least 100 feet from any stream and from the kitchen.
- 1. Pack and Saddle Stock At least 300 feet from kitchen and, if possible, down wind from camp.



Camp Facilities

<u>Kitchen</u>: Arrange for serving food cafeteria style. In camps of more than 100 men, provision should be made for serving two lines. For double-line feeding, either a "T" or "L" table constructed of poles or rough lumber will serve the purpose. Provide for food and kitchen-equipment storage, stoves, dish washing, and a cook's work table. Rope or fence the entire kitchen area. A power saw can be used to quickly rough saw planks.

Tool Depot: Allow ample space for segregating tools and other equipment by kinds and for reconditioning. Tool groups should be so arranged to permit rapid issuance of tools. Tool racks, one for each crew, should be provided and each one identified with a sign showing crew name or number. Rope or fence the area.

Timekeeping Station and Commissary: Provide tables and chairs or equivalent as needed. Protect from weather with tent fly. In small camps where the camp boss records time and handles commissary, this would also serve as his headquarters. Special camp boss trailers are available at the interforest caches and at Wenatchee. This trailer is described in the ^F.C. Equip. Hdbk., Section N (See Appendix of this chapter for contents of trailer).

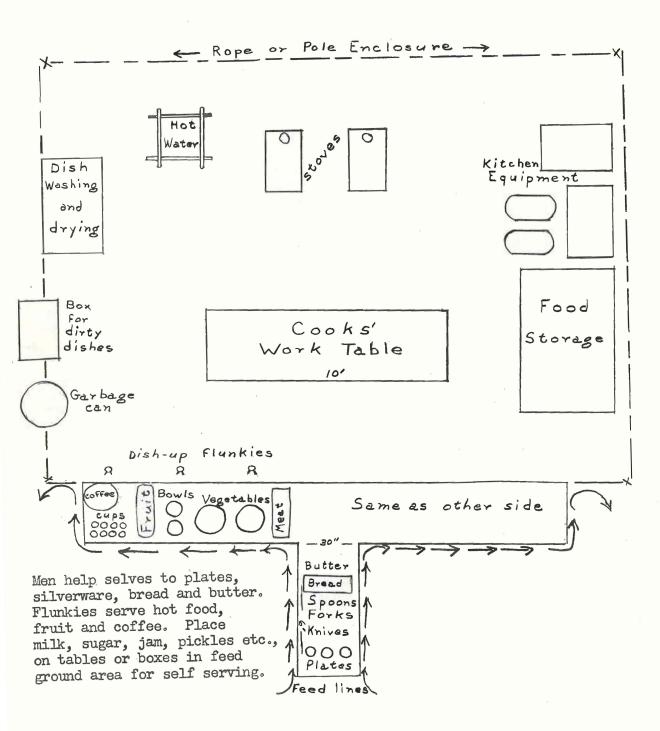
Fire Boss, Camp Boss and Scouting Headquarters: It is usually best for the camp boss to have a separate headquarters. In large camps or base camps where headquarters are separated, a telephone for each headquarters should be provided. Scouting headquarters should always be with or contiguous to that of the fire boss. Provide tables and chairs or equivalent as needed for fire overhead conferences.

Bed Grounds: Area should be staked or marked for sleeping by crew units and identified with signs showing crew name or number. Pit latrine should be conveniently located. More than one may be required if grounds cover large area. Designate spots for warming fires and drinking water.

First-Aid Station: In camps of more than 100 men or camps where the injured or sick might be taken for treatment from other camps, a tent furnished with cots, blankets and necessary first-aid supplies should be provided. Post directional sign.

Washup Station: Build pole rack or flatten log for wash basins. Provide hot water. Provide water containers, adequate number of basins, paper towels, receptacle for used towels, and lanterns. Area should be well drained. Post directional signs at bed grounds and in camp-service area.

Latrines: At least one at bed grounds and one for camp force in large camps, straddle or pole type. Well defined pathway lighted at night with lanterns and one at the latrine. Leave shovel at pit for sprinkling with dirt. Post directional signs at bed grounds and in camp-service area.



Garbage Pit: Dig a large pit; use dozer if one is at hand. Flatten cans; burn boxes and cartons.

Pack and Saddle Stock: Provide hitching rail and feed racks. Clear area for feed storage. Gravity water supply should be provided if possible. Fall dangerous snags, remove rocks, and chop off sharp knots and limbs on logs in stable area.

Receiving, Organizing and Dispatching Crews

Orders for men needed on the fire will usually come from the fire boss or planning boss, with instructions as to where and when they are to report. When such orders are received, forward them at once to the district ranger's headquarters or other appropriate point, as required; ascertain the approximate time men will arrive in camp; and make provision for meals, lunches, beds and equipment, and for distributing the men according to instructions.

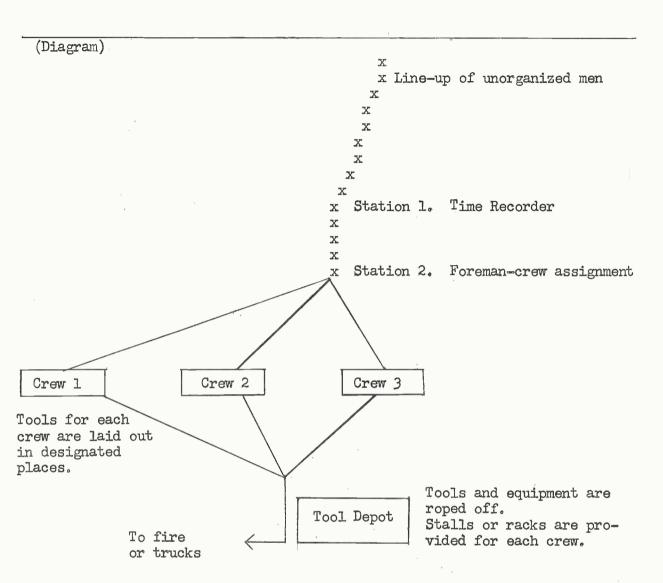
Receiving Men and Organizing Foreman Crews

Large numbers of men may arrive at a fire under various conditions, and the problem of organizing and getting them started for the control line may sometimes become difficult. Organized crews, such as loggers, are usually an exception. Segregation of firefighters into foreman crews will be done by a man well qualified to select men for specific duties and to judge their qualifications. Final screening of men for physical fitness and proper clothing should be made at this time. In any situation where a large number of men must be organized quickly, a previously prepared plan is essential to avoid confusion and loss of time and to promote efficiency. The diagram on the following page illustrates how to organize men into foreman units, equip them with tools, and dispatch them to the control lines in the shortest possible time.

Men arriving who are not immediately needed on the fire line should be processed and organized into foreman crews or as a replacement group, whichever the fire boss orders. If organized into foreman crews, they should remain at the designated foreman—crew space in the bed grounds until they are called. Foremen will stay with their crews. If for replacement or transfer to another camp, someone should be placed in charge of the group and required to remain intact in a designated area, pending final disposition.

Dispatching Crews

A prearranged hour for departure of crews should be agreed upon by the line and camp personnel in charge. Calculation of a sequence schedule for cook-tent call, crew call, mess call, and lunch and tool pick-up should then complete the plan of action in camp. Crews scheduled for earliest departure should be called and fed first to avoid bottlenecks at the first-aid station, mess line and tool depot.



(Note: The men are lined up and pass by Station 1. The time recorder checks each firefighter's contract and returns the duplicate copy of contract to the man. If the man has no contract, he is issued one or sent to one side for later attention. Foremen have previously been issued 2 copies of Foreman Fire Time Book and Notebook, Form 875-R6. Foremen will list in these books the name and contract number of each man assigned them at Station 2. If necessary, men will then be fed by foreman crews and lunches furnished. In the meantime, the camp boss or equipment and supply assistant has been furnished tool requisitions, and men pick up tools as they pass the tool depot.)

-Crew Bosses- will be responsible for their crews being dressed, checking in beds, receiving first-aid attention, arriving in the mess line on time, eating promptly, obtaining tools and lunches, and leaving camp without delay.

Camp personnel will have the required facilities fully functioning to prevent congestion at each point. This is the most important job of the camp boss. Plan carefully in advance and see that the plans are carried out. Frequent checks should be made by the camp boss to see that the schedules are maintained.

Record of Overhead.

The camp boss should maintain a record of overhead in his camp by name, home forest, assignment, date of arrival and date of transfer or release. The *-Service Chief-* should keep a similar record of all overhead on the fire. When overhead is released, the home forest should be advised.

Messing

Much of the successful operation of a fire camp is dependent upon adequate handling of the mess. Meals must be ready on time, sufficient in quantity, of good quality, and served rapidly. Intelligent planning and good management are required.

Kitchen Arrangement

The kitchen should be arranged for serving cafeteria style and for double-line feeding in camps of over 100 men. Lines should be kept moving steadily. Bottlenecks should not be permitted to develop.

The cook's work table, food stores, kitchen equipment and stoves should be in a compact arrangement in conjunction with serving tables to save steps and eliminate unnecessary confusion. In one part of the area, provide for dish washing and drying rack near facilities for heating water. Maintain an ample fuel supply (gas or wood) near the stoves. Water supply should be conveniently located.

Provide a garbage can and require men to clean dishes of unused food and deposit dishes in receptacles placed nearby.

Food supplies should be stored off the ground, protected from weather, and in an orderly manner for convenience of the cooks and so that inventory can be quickly taken.

Kitchen Equipment

Standard 100-man camp and mess outfits include all necessary equipment for preparation of and serving food for 100 men. Additional units of 25-man and 50-man outfits are obtainable in numbers required. See Form 4-R6 Fire Equipment Requisition and Invoice.

Stoves. Liquid gas ranges and Kimmel stoves are standard in mess outfits. Liquid gas ranges, using Flamo-type gas in cylinders, are available at interforest fire caches. These units are intended for use in camps having truck transportation and for kitchens where camps are supplied with hot foods from a central point. A cylinder of gas should be requisitioned with stoves. Caution: When using Flamo gas, all connections should be tight to prevent leaks. Gas will settle in low areas and explode if ignited. Pressure to range should not exceed 5 pounds.

Water Heaters: The most widely used method of heating water is in a G.I. can set on cooking irons over an open fire. A drum-type heater with heating coils is described in the F.C. Equip. Hdbk. This heater has been found to be most practical, is fast and requires but a very small amount of fuel compared with the open-fire method. These and heaters using Flamo-type gas are available at interforest caches. A cylinder of gas should be requisitioned with heater. The latter should be used only in connection with cooking stoves using gas for fuel. Always maintain a plentiful supply of hot water at the kitchen and washup station.

<u>Dishes:</u> *** All forests and interforest caches carry a stock of paper or disposable eating utensils. Full use of disposable dishes should be made, particularly in camps serviced with hot foods from central kitchens and airplanes.

Central Kitchens

On fires where two or more camps are established or men are camped in mobile camps at strategic points on the fire line and transportation (truck, pack string, airplane) permits, consideration should be given to servicing crews with hot food and lunches and from a central kitchen. This is a service requiring close coordination between the *-Service Chief-* and the camp bosses to insure delivery of food in quantities required and at times specified. The advantages of this method lay principally in the following:

- 1. Elimination of kitchen facilities in outlying camps.
- 2. Reduction of camp overhead and labor.
- 3. Greater mobility of crews camping on fire line.

Meals

Ascertain from the responsible line officer and check with him frequently:

- 1. Number of men to be fed.
- 2. Time crews are expected to leave camp.
- 3. Time crews will return to camp.
- 4. Number of lunches needed.

R-6 F.C. Hdbk. *Amended ***Deleted 7-26-54 No. 85 Prepare a meal-time schedule for the head cook and keep him informed of changes as they occur. Always be prepared to feed in cases of emergency. Make frequent checks to see that preparation of meals is going according to schedule.

Menus: Menus should be prepared one day in advance and in accordance with authorized supplies contained in ration tables, which will be found in the Appendix. Reference should also be made to the Subsistence Supplies section of this chapter, immediately following.

Lunches: Line officers are instructed to use lunch requisition forms in the Fire Fighting Overhead and Foreman Notebooks and to submit them well in advance to allow ample time for preparation. These will indicate number of lunches, whether single or double, when they should be ready, and method of delivery. Lunches should be appetizing and as of wide variety as possible. In packaging lunches, they should first be placed in cellophane bags, then in paper bags. If men are to carry lunches individually, they should be furnished cloth bags for this purpose, and men should be instructed to save the bags for use on succeeding days.

Subsistence Supplies

Size of Stock in Fire Camps

It is necessary to maintain a sufficient supply of staple foods to insure always good meals and palatable lunches but not to carry an excessive stock, which might be partly wasted in case of sudden termination. As a rule, stock should be sufficient to last from 2 to 3 days, depending on condition of fire and transportation facilities. Because of this small margin, close attention must be given to the matter of taking inventory and ordering, so as to keep the stock balanced and avoid running out of certain essential articles or acquiring a wasteful surplus of others. Large stocks on hand at end of fire should be avoided.

Purchasing

Securing of supplies is ordinarily done by the regular forest purchasing department, augmented by such extra help as is needed. Full use of this procedure should be made in ordering supplies for fire camps. In certain cases, it may be desirable to purchase supplies directly from the fire camp. If this is done, purchase orders must be issued for all orders placed. Commissary items must not be included on purchase orders for subsistence supplies.

Authorized Supplies

Luxuries such as expensive vegetables or fruits, precooked cereals, fancy cuts of meat, etc., should not be ordered. The authorized 5-day ration tables in the Appendix contain a sufficient variety of staple foods, and the purchasing of articles not shown in these tables is not approved.

It is desirable to furnish fresh vegetables as well as canned vegetables where available: For camps on roads or where packing farther than 5 miles is not involved, such fresh fruits as will stand transporting may be furnished if the cost does not exceed that of canned fruit. A reasonable proportion of dried fruit should be used even where packing is not involved, and for distant camps, the proportion should be materially increased.

Special attention should be given to supplies for individual lunches, particularly in initial orders. For initial orders, about one-third the meat allowance and one-half the fruit allowance should be obtained for this purpose, the latter in No. 1 cans.

Procedure for Ordering

Use the one-man-for-one-day ration table as a basis for making up orders. The three-day and five-day tables, which are based on the one-day table, will be most convenient for initial orders. These tables will be found in the Appendix.

The cook will make a careful daily inventory of stock on hand and give it to the camp boss. Use the Subsistence Inventory and Requisition, Form 3-R6. Copies of inventories and requisitions should be preserved for reference.

Find the number of rations (food for one man for one day) of meat, breadstuff, cereals, potatoes, vegetables, fruits, beverages, milk, butter, shortening, salt, and miscellaneous small items on hand. These figures divided by the number of men in camp will show how many days each item will last. The next step is to figure out a tentative list of supplies which will balance up the stock on hand. If the total weight of this list is less than a full load for the pack train (where packing is necessary), the order should be completed by adding to it a balanced ration for one or more days, depending on capacity of pack train, elapsed time before it will arrive, and size of surplus stock which it is desirable to carry in camp.

For example, assume that in a camp of 60 men there is a 1 day's supply (or 60 rations) of milk and of potatoes, a 2 days' supply (or 120 rations) of meat, and a 4 days' supply (or 240 rations) of all other essential items. Obviously milk, potatoes and meat are most urgently needed. The tentative list should, therefore, be for a 3 days' supply (180 rations) of milk and of potatoes, and a 2 days' supply (120 rations) of meat. According to standard tables, this would mean total weight of about 440 pounds. If this is not a full load for the pack train, add to it a balanced list of supplies, including, of course, additional milk, potatoes and meat. For determining the number of complete rations which may be added to tentative list, divide the additional weight which the pack train can carry by $6\frac{1}{2}$, which is the approximate weight of a ration for one man one day, including containers and cases.

Weight has been carefully considered in the ration tables for camps where packing farther than 5 miles is involved. To avoid unnecessary weight and excessive bulk, stick to these lists. For all such camps it is important that containers be marked so that essential articles will not be overlooked on the first trip. On small fires standard or special emergency rations may be used the first day or two if more practicable.

Storage in Camp

Subsistence supplies must be properly stored to prevent waste. Perishables such as fresh fruit, vegetables, and butter should be placed in the coolest place available, and sheltered from the sum. Meat should be stored in screened boxes constructed for that purpose, or otherwise protected from flies; should be protected from the sum; and should be kept in a cool place. Such location may be at a spring or along a creek. The use of wet burlap placed over the receptacle in which meat is stored will help to keep the temperature down.

Staple articles should be stored in a tent, if available, placed adjacent to the kitchen for the convenience of the kitchen force and to prevent theft.

Tools and Equipment

Source of Supply

Forest stocks of tools and equipment will be used until exhausted, then calls may be made on the nearest interforest cache. Interforest caches are in a position to furnish complete 100-man line and camp outfits or individual items of equipment if so requisitioned.

Ordering from Interforest Caches

Usually orders will be placed through the forest supervisor's office. Regional standard 100-man outfits may be ordered by number of outfits, if complete outfits are desired. Additional or special items, if stocked, can be ordered at the same time. These outfits plus extra items will be invoiced by the interforest cache on Form 4-R6, Fire Equipment Requisition and Invoice.

If complete 100-man outfits are not desired, individual items needed may also be listed on Form 4-R6, and orders placed accordingly. Do not order standard 100-man outfits unless all items are needed.

Receiving

All shipments received should be checked against purchase order or requisition and invoice forms as unloaded, and notation made of any shortages or damage. One copy of the purchase order form will then be receipted and returned to the officer making the shipment, the other filed; or if requisition and invoice form is used, copies will be distributed in accordance with the instructions on the back of the form.

Storage

When tools are unloaded, they should be segregated by kinds and arranged conveniently, so that they can be readily distributed to foreman units. Tools should not be allowed to become scattered or to be taken by individuals without permission.

Foremen should usually be instructed to have their men bring tools to camp each night. A place for storing tools used by each crew should be provided and marked with the foreman's name or crew number. Broken tools must be brought in for repair or condemnation. Tools and other equipment in need of reconditioning will be exchanged for others in good condition. Flash-lights and headlights should be checked for defects and refilled with fresh batteries before placing in stock.

Tool and Equipment Distribution

Line officers are instructed to order tools on the Tool Requisition form in the Fire Fighting Overhead and Foreman Notebooks and to submit them sufficiently in advance to allow for assembling and placement in foreman crew stalls or racks.

Water Bags: Requisitions should indicate if bags are to be filled. Bags should be soaked before issuing.

Beds: Sleeping bags should be issued to individuals and receipted for. Form AD-128 or a store sales slip may be used for this purpose. Receipts are turned over to the time recorder for entering as a property charge on time reports. When beds are turned in, the individual is given a receipt for presentation to the time recorder. The bed identification tag described in the $F_{\circ}C_{\circ}$ Equip. Hdbk., Section N, should be used to identify the bag and to indicate whether it is clean or used. Strict accountability is required.

Preventing Losses

As a rule, the foreman will be held responsible for tools issued to him for his crew's use. Special items such as flashlights and headlights should not be issued to individuals but charged to the foreman. Either a packsack or a gunny sack should be furnished the foreman so he can collect all headlights at break of day while on the line and not permit his crew to enter camp with them in their possession.

Returning Tools and Equipment to Caches

It is required that all tools and equipment received from interforest caches be returned as soon as they can be spared, as they may be urgently needed on other fires. They should not be reconditioned at the fire.

Responsibility for cleaning and properly assembling tools and equipment when the project is completed rests with the camp boss unless he is specifically relieved. He should round up all equipment, make a complete inventory, determine exact losses, and prepare a list showing such shortages.

Tools that are broken beyond repair or worn out should be listed separately and both lists turned in to the district ranger's or supervisor's headquarters for proper action.

Unless otherwise instructed by the fire boss or district ranger, all equipment should be returned to the cache from which it came, so far as this is practicable. List items to be returned on Form 4-R6. It is a strict rule that all tools and equipment must be put in condition for immediate use before going into a forest cache. Whether this can be done best at the fire camp or elsewhere will be determined by the fire boss or district ranger. Special attention must be given to cleaning and drying cooking and mess equipment, to prevent rust and other deterioration. Standard kits should be carefully assembled and any shortage shown on tags attached to containers.

Renting Equipment

Advance contracts for the rental of equipment such as tractors, trucks, horses, airplanes, pumper outfits, etc., are usually made by the district ranger or supervisor prior to the fire season and listed in the fire suppression plan. The forest or ranger district fire suppression plan should be referred to where the hire of such equipment is requested. In cases where advance contracts have not been made and the hire of equipment, including personally-owned automobiles, becomes necessary, a Form FS-587, Equipment Agreement (Rental or Hire) should be prepared in all cases. A sample is included in the Appendix. The current schedule for rental of private equipment is also contained in the Appendix.

Maintenance

A competent man should be employed to sharpen and repair tools and equipment in camp.

An adequate supply of gas, oil and grease for trucks and liquid gas for ranges and hot water heaters should be provided at the time camp is established, as well as white gasoline and kerosene for lanterns, and maintained thereafter.

Transportation

General Planning

Adequate and effective facilities for the movement of men, supplies, equipment and carried messages should be provided for as early as their need can be foreseen. The most effective means should always be employed.

A reasonable margin of carrier capacity should be provided to compensate for expected breakdowns and delays. Gasoline, oil and grease facilities must be available, and a competent man should be made responsible for servicing and checking all motorized equipment. Provision should also be made for servicing and packing gasoline, oil, etc., to tractors and pumpers being used on the control line.

Procurement of Equipment

Government carriers should be used as far as possible, after which private vehicles, pack stock, or airplanes may be secured under contract of hire. Rangers' and supervisors' fire suppression plans will list the best sources of available equipment for both government and private items.

Pack and Saddle Stock

Stock should be properly shod, pack equipment should be maintained, and an extra supply of lash rope, cinches, etc., should be on hand. Packers can ordinarily be depended upon to care for the animals in their string. It is necessary, however, for the camp boss or transportation *-officer-* to see that extra saddle stock is watered, fed and otherwise properly cared for.

Transportation Reminder List

- 1. Excessive speeds and extreme overtime use of drivers are not conducive to safety and dependable service.
 - 2. Routes of travel must be established, posted and maintained.
- 3. Drivers or packers should be dispatched by written instructions as far as practicable.
- 4. Back-pack, horse-pack and airplane cargoes should be checked for excessive bulk, nonessential items and proper packaging, to avoid breakage and loss.
- 5. Proper mileage and hourly or daily use records should be kept for all transport equipment.
- 6. Man-pack and horse-pack loading must be carefully gauged to distance, travel time and terrain.
- 7. Cargoes should be arranged as orders are received to avoid delay and improper loading.
- 8. A truck or other vehicle for special ambulance service may need to be provided in larger camps.

Communication

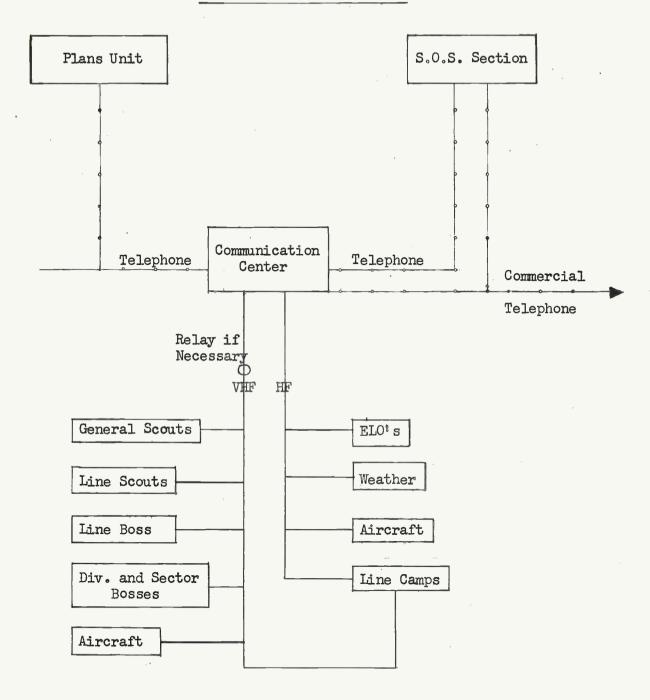
-On large fires employing a Communications Officer, it will be his responsibility to establish and maintain communication. On smaller fires the camp boss will usually be responsible for this service.-

Communication between the fire camp and the *-equipment and supply centers-* or other designated point must be established immediately and maintained. Where there is more than one camp, communication should be established between them. Communication must also be established between the fire camp and the control line. Telephones, radios, or messengers may be employed for this purpose.

Radios and other communication equipment should be taken in at the time of occupying the camp. Telephone communication is to be used wherever available; supplement radio communication with telephone and emergency wire where the amount required is not excessive.

A Project Fire

Communication Service Plan



R-6 F.C. Hdbk. Page Added 7-26-54 No. 85 Unimportant conversations over the radio or telephone should be avoided in the interest of more efficient handling of fire business. Messages particularly are to be written so far as practicable, transmitted and delivered promptly. In case of large fires, routine business (e.g., food, supply and equipment orders) is to be transmitted at times when other fire business will not be interfered with. A schedule for transmission of routine business should be established for both radio and telephone.

-A Project Fire Communication Service Plan is shown on preceding page.-

Records and Reports

Progress of Fire Report

Information on progress of fire will be assembled and recorded by the planning or scouting unit if one is employed. In the absence of such a unit, the camp boss will be responsible for keeping progress records and making a daily statement showing the following so far as his information will permit:

- 1. Number of men employed:
 - a. Effective firefighters
 - b. Supervisory personnel
 - c. Camp overhead
- 2. Fire-line equipment
- 3. Daily increase in area of fire
- 4. Length of control line built and location
- 5. Length of control line lost and location
- 6. Length of control line yet to be built, with estimate as to when it will be completed.

Items 3 to 5 inclusive should be recorded in the form of a cumulative map.

Record of Liabilities

A record should be kept of all liabilities originating at a fire camp. An account of any or all of the following will be made when the project is completed:

- l. Wages of temporary laborers and overhead hired for fire fighting (Do not include time of yearlong officers or members of the guard force temporarily employed on the fire).
- 2. Cost of equipment, subsistence supplies, commissary, etc., purchased directly by the camp.

- 3. Rental and operating costs of pack horses and motor vehicles working at or from the camp.
- 4. Cost of transportation and board for employees enroute when ordered by the camp.
 - 5. Miscellaneous liabilities incurred at camp.

The first requisite for keeping accounts straight is to have everything in writing. All orders or requisitions, even where telephoned, and all contracts should be written in full on Form AD-128, except where special forms are provided. Each order or requisition should be given a serial number and date and should be signed with name and title.

The file copies of Form AD-128, remaining bound in the book, will be a complete serial record of orders for supplies and equipment; commissary (separate book and series of numbers); hire of pack stock, trucks, and any other equipment; and requests for transportation, board at hotels and restaurants, lodging, etc., originating at camp; and property received and transferred. Form AD-128 should also be used to record all liabilities not originating at camp but reported by others, for which merchants' bills or other written record are not received.

Time reports, commissary account book, property record book, Forms AD-123, and bills will constitute a complete written record of all known liabilities. These should be arranged in a systematic order so that needed information can be quickly obtained. On large projects it is advisable to use a part of the commissary account book, or a separate book, for ledger entries of bills received, showing simply the date, name of merchant and amount.

Approved copies of Form AD-128 must be forwarded to the district ranger's office, or elsewhere as directed, as soon as the goods have been received and checked. This is particularly important in case of orders from ranchers, country and small town merchants, and restaurants, as their accounts should ordinarily be paid promptly without waiting until the end of the month.

Daily Activity Record

To provide accurate data for the fire report (Form 929), a daily record of activity must be kept in the camp. This record should consist of at least the following:

- 1. Arrival or departure of large crews.
- 2. Arrival or departure of overhead (either local or from other units).
 - 3. Arrival or departure of heavy line-building equipment.

R-6 F.C. Hdbk. Revised 4-20-51 No. 63

- 4. Important radio messages.
- 5. Important telephone messages.
- 6. Movement of crews between camps.
- 7. Establishment of new camps.
- 8. Abandonment of camps.

This record should be turned in to the district ranger or supervisor at the end of the project.

Property Accounting

Accountability for tools and equipment issued for use on the control line will be charged to foremen or to individuals. A reasonable valuation will be deducted from time slips for property charged and not satisfactorily accounted for.

Form 4-R6 or Form AD-128 should be used to list all property being transferred between supply sources and camp, or between camps or fires. The issuing clerk should, in all cases, secure signature of the receiver and retain the original.

Sanitation

The location of camp facilities as described in the Camp Planning Section of this chapter state the minimum distances that the kitchen, garbage pit, latrines, and pack and saddle stock should be located from the source of water supply. All facilities should be below the intake of the supply for cooking and drinking purposes.

Certain precautions are necessary to safeguard the general health of all personnel. It is highly important that everything possible be done to prevent sickness among the men. Maintain a clean camp. To insure this, the following precautions must be taken:

Kitchen

Cleanliness in the kitchen, both as to persons and dishes, must be insisted upon. Make known to the entire kitchen force the following rules and inspect twice daily to see that they are enforced:

- l. Do not permit any unauthorized persons within the kitchen enclosure.
- 2. Insist on personal cleanliness of all who handle food. Provide white aprons and caps to the extent possible.
 - 3. Abate flies and insects. Keep fly spray off foodstuffs.

R_6 F.C. Hdbk. Revised 4-20-51 No. 63

- 4. Wash dishes thoroughly in hot soapy water. Sterilize by boiling washed dishes at least 3 minutes. Air dry. Dishes and cooking utensils must be free of soap residue.
 - 5. Do not allow cans or bits of food to lie around.
- 6. Police the feed ground and around kitchen following each meal. Pick up and dispose of dropped food and rubbish.
 - 7. Do not use spoiled foods.
 - 8. Do not put lemonade or other acids in galvanized or tin containers.
 - 9. Keep ground sprinkled to lay the dust.
 - 10. Protect meat with wool sacks (See Appendix on food poisoning).

Water Supply

Eliminate any possibility of contamination. Inspect source of supply a considerable distance above intake. If there is any uncertainty about purity of water, it should be chlorinated and lister bags used for drinking water.

Garbage

Covers must be kept constantly on garbage cans when not in use. Nothing should be left uncovered for flies to feed upon. Cover refuse in garbage pit with a layer of dirt at least once each day.

Latrines

Make them easily accessible and post an adequate number of directional signs. Have well-defined pathways and provide lanterns at night leading to and at latrines. Keep a shovel stationed at each latrine. Cover trenches with a layer of dirt or spread chloride of lime at least twice daily.

Washup Station

Maintain an ample supply of basins, soap, paper towels, hot and cold water. Keep the area well drained. See that used towels are placed in receptacles provided. Sprinkle area occasionally with chloride of lime.

Bed Grounds

Keep drinking water fresh. Foremen are responsible for keeping their bedding area clean. Provide receptacles for rubbish. Foremen should see that men roll and pile their beds before leaving camp. They should be on the lookout for men with infectious diseases and report all such cases to the camp boss. Persons thus infected must not be allowed to remain in camp. Their sleeping bags should be set aside, marked, and returned as soon as possible for disinfecting.

R-6 F.C. Hdbk. Revised 4-20-51 No. 63

Safety and First Aid

Accident prevention is the definite responsibility of every forest officer. Take every precaution to safeguard the men against possible injury. When accidents do occur, the injuries must be promptly and properly attended to in order to prevent more serious consequences and additional expense to the government as a result of claims for compensation. Treat every injury, no matter how slight, as soon as possible in order to prevent infection. Prevent accidents by removing the cause.

Camp

As stated under Camp Planning, the camp site should be located so as to be safe from the fire itself and men will not be endangered from rolling rocks and dangerous snags. All dangerous snags within reach of any part of the camp area should be felled.

Fire Safety Officer

Responsible to the fire boss and not part of the SOS organization, he will, however, make safety inspections in the fire camp as well as on the fire line. He will also make accident investigations and help in completion of compensation—for—injury forms.

Transportation

All automotive equipment must be maintained in first-class mechanical condition. This is the responsibility of the transportation *-officer...*
The following rules must be observed:

- 1. Trucks transporting tools with men will be provided with tool boxes fastened to the truck body and the tool box lid secured.
- 2. Seats must be provided and men required to remain seated while truck is in motion.
 - 3. Steps or ladders must be used for men entering and leaving trucks.
- 4. Truck drivers should not be required to work long hours to the extent that they become extremely fatigued.
 - 5. Excessive speeds or unsafe driving practices must not be allowed.
 - 6. Equipment inspections should be planned and made regularly.

It is the responsibility of the camp boss or his transportation *-officer-* to see that these rules are enforced. The crew *-boss-* has this responsibility while trucks are away from camp and transporting men.

Fire Precautions

Fireproof around all fires built in the camp area and check them frequently.

Two back-pack cans filled with water and ready for instant use should be located at the kitchen. All kitchen help should understand the use and operation of this equipment for fire protection.

A carbon tetrachloride fire extinguisher should be located at the oil and gasoline storage and where gasoline lanterns are filled. Gasoline should be stored in the shade.

Gasoline lanterns must be filled in daylight hours only. Never fill a lantern when lighted or warm.

First Aid

An adequate stock of first-aid supplies must be available both in the camp and on the control line. First-aid kits should be inspected daily for completeness and replenished if necessary. Both individual and crew-size first-aid kits should be supplied. A stretcher should be on hand.

Men should be required to visit the first-aid *-officer-* for treatment no matter how slight the injury may be. A supply of foot powder is a must in a fire camp. Foremen are instructed to carefully note the condition of their crew members, particularly with regard to their feet. Blisters should be treated at the first opportunity.

Compensation for Injury

The U. S. Employees' Compensation Act provides for relief of government employees who are injured in the course of their imployment. Reports to Federal Security Agency, Bureau of Employees' Compensation are necessary, and error or delay in their preparation may cause hardship to the employee.

Form CA-1 must be signed by the injured employee within forty-eight hours after the injury. Form CA-2 provides for detailed information as to the injured employee and the injury; also for statements of two witnesses and certificate by attending physician. Immediately after an injury occurs, these two forms should be fully completed in every feature and forwarded to the forest supervisor through the district ranger. Cases of injury sustained on project fires will be turned over to the first-aid man or camp boss, depending on the arrangement.

If necessary, the injured employee should be sent to a designated physician with a written request for treatment on Form CA-16. Where there is doubt concerning the employee's right to medical care or compensation, as in case of illness, request for medical treatment should be made on Form CA-17. Where no designated physician is available, any recognized

physician will be acceptable, but the request for treatment must be on Form R6-A10 instead of Forms CA-16 or CA-17. In case of accident or alleged illness which did not result from the man's employment on the fire, no request for medical treatment should be issued. The employee should, however, be allowed to execute Form CA-1. Form CA-2 should also be prepared as no employee can be denied the privilege of submitting a case for consideration by the Bureau of Employees' Compensation. *Form CA-20 is the Attending Physician's Report. It should be furnished the nondesignated physician along with Form R6-A10 and Form S-69, which is the form the physician uses in presenting his bill.-*

Compensation cases should be prepared promptly while the circumstances of injury are fresh in the mind of the employee and witnesses are at hand to furnish necessary information. Witnesses' statements must be secured while witnesses are still in camp. The district ranger, camp boss, or other responsible overhead on the fire should be consulted whenever doubt arises as to correct procedure in cases of severe injury or illness. When employees who become ill are not entitled to the benefits of the Compensation Act, everything should be done to relieve them, and, if necessary, to enable them to reach medical care.

Refer to regulations of the Bureau of Employees' Compensation, which will be found in the camp boss outfit.

Commissary

When Necessary

Where the crew is small or the job of short duration, it is desirable to avoid establishing a commissary. This can usually be done by having employees pay the packer or truck driver in advance for any personal supplies they may need. On large fires, however, commissary items must be provided for the welfare of the crew.

Procedure for Purchasing

All orders for commissary supplies will be placed with the understanding that any undamaged surplus will be returned to merchants and only the net purchases vouchered. Purchase orders, invoices, statements, and inventories for commissary supplies must be kept separate from those for subsistence supplies. Original priced invoices must accompany commissary supplies to show cost to the government of individual items, so that the amounts to be charged the men can be computed.

Each shipment received must be checked immediately with copy of Form AD-128, and this form must then be receipted and sent to the supervisor or elsewhere as directed, a copy being retained in the camp files. Any discrepancies should be noted and necessary adjustments made promptly.

Aim to have the least possible supply of commissary on hand when the fire is over.

Authorized Items

Stocks should be ample to provide necessary items, but must not be expanded to provide for all individual tastes. A list of approved commissary is shown in the Appendix. Purchases should be rigidly held to this list.

Special items such as shoes may be purchased for employees if convenient and if necessary for the job.

Procedure for Selling

The selling price of any commissary item will be 10% over cost, to the nearest 5 cents. For example, a pair of socks costing 43¢ with 10% added would be valued at \$0.473, but the selling price would be 45¢. If the cost were 44¢, the value with 10% added would be \$0.484, but the selling price would be 50¢. On single articles, such as shoes, costing \$5.00 or more, charge only 5% above cost.

Commissary accounts cannot be allowed to exceed amount of wages earned to date. If exceeded, the officer responsible will be held accountable for any excess in case the employee quits or is discharged. Cash must not be accepted for commissary purchased with government funds.

The practice of issuing commissary just before the men go out on the fire line or late at night is not desirable. Post a notice showing the hours the commissary is open and rigidly adhere to this schedule.

Charges for commissary issued to the crew may be made by use of coupon books or itemized account for each item purchased. Use of coupon books is the most desirable method of handling and is as follows:

Coupon books in \$1.00 and \$2.50 denominations have been provided. Books may be procured by firefighters upon application to the timekeeper, but not until sufficient wage credit has been accumulated to cover the cost. Accurate record of coupon books issued must be kept, as they represent cash and must be properly safeguarded at all times. In addition, each book issued will be charged by number and amount on the employee's time report when issued, and the receipt taken from the issued book will be attached to the report to support the charge. Partly used coupon books must not be reissued.

Coupons will be detached by the timekeeper or commissary clerk at the time of purchase of commissary. Detached coupons will be preserved each day in a sealed envelope. Coupons are not transferable and are void if detached when presented to the commissary. Instructions to this effect should be posted.

Credit will be given the employee at the time of his discharge for unused coupons remaining in the book. Both debit and credit entries will be made in the commissary block on the time report. Used coupons and books will be preserved and turned in to the supervisor at the end of the project.

R-6 F.C. Hdbk. Revised 4-20-51 Purchases of coupon books by regular employees will be accomplished through the use of Form AD-128, the original of which will be sent to the supervisor of the unit to which the employee is assigned for proper payroll deduction. Unused coupons will be covered by credit Form AD-128. Duplicates of Form AD-128 will be forwarded to the regional fiscal agent to be used in checking payroll deductions. On fires of short duration or if coupon books are not available, commissary items may be listed directly on the time report.

Accounting

Commissary stocks are charged to officers receiving them, the same as property. The camp boss will be held responsible for an accounting of all commissary received, and he may in turn hold the time recorder responsible for articles turned over to him.

An account book record must be kept of all commissary, by items, showing amounts received and issued and balance on hand. Check this balance daily with stocks on hand after closing. A simple method of showing the daily inventory and balance is as follows:

Cost of goods on hand last inventory	\$125.00	
Cost of goods received since last inventory	46.25	\$171.25
Cost of goods on hand this inventory	\$131.45	
Cost of commissary issued since last inventory -		
\$43.70 (selling price) divided by \$1.10	39.73	\$171.18

The final figure thus obtained will not exactly balance the inventory, but it should do so within a dollar. Copy of this inventory should be given the camp boss for transmittal to the supervisor.

All losses or damage to commissary stores must be promptly recorded, indicating cause of loss or damage and date. This record is required for the purpose of furnishing the necessary information for making a property loss report at a later date.

Storage in Camp

Commissary in camp should be stored in locked boxes or bags, and under the direct charge of the officer responsible. Probably the best method of storage is in boxes with shelves for storage space provided for each item carried in stock.

Transfer Between Camps

Where commissary is transferred from one camp to another, it should be accompanied by an itemized list on Form AD-128, in duplicate. One copy of the form should be receipted and returned and the other filed by the receiving officer. Every effort must be made by officers transferring commissary to protect it from loss or theft. It should not be transported from headquarters to camps or between camps in open boxes, particularly when transported in a truck with laborers. Canvas bags with locks are available for transportation and protection of commissary in Jarge camps.

R-6 F.C. Hdbk. Revised 4-20-51 No. 63

Closing at End of Project

At the completion of the job, a summary statement should be prepared showing by items the total number of articles issued and values deducted from wages, plus transfers, if any, to other camps. This, added to an inventory of surplus stock on hand, should balance with the total of bills received from merchants, plus Forms AD-128, if any, for transfers from other camps.

Undamaged surplus stock should be returned to merchants or elsewhere, as directed, and an itemized list furnished the district ranger or supervisor so that similar items be stricken from invoices and not vouchered.

The record of all items lost or so damaged that they cannot be returned to merchants should be furnished the district ranger or supervisor with an explanation of such loss or damage.

Employment

Hiring Firefighters

In hiring men for fire-suppression work on large fires, the employment officer should be guided by the following instructions. (These instructions are not always applicable for small fires or in connection with the employment of local cooperators by telephone or by advance arrangement, the cooperator understanding the terms of employment from previous experience or training.)

Where it is determined that *-there is a possibility the land owner, operator, or contractor may be-* responsible for suppression costs, employees of the responsible party should not be contracted or placed on Forest Service payrolls.

- 1. After ordinary resources of the forest have been exhausted, reference should be made to the fire-suppression plan for instructions relative to recruiting additional men.
- 2. Secure only competent men who are physically fit, properly clothed, including adequate footwear. Health certificates for kitchen help are desirable and can usually be required in larger cities.
- 3. Fill out the standard Firefighter's Contract, Form 106-R6, completely and in duplicate for each man hired.
- 4. Be sure that every man understands the terms of his contract, particularly those dealing with transportation and travel-time allowances. Impress on him the fact that it is impossible to know in advance how long the job will last.
- 5. Explain probable living and working conditions and approximate mileage men will have to walk to reach fire camp. Except for the initial work period, work shifts should be limited to about 8 hours per day. To provide continuity on the fire, travel time to and from the fire will usually be in addition to the actual 8 hours worked. Those involved in SOS and dispatching services should be assigned definite responsibilities and work hours and should be given enough help so no one need work over 10 hours per shift.

R-6 F.C. Hdbk. *Amended 7-26-54 No. 85

- 6. Provide the classes of labor which the fire boss has requisitioned. Cooks and flunkies should be contracted as such in order to prevent a shortage of kitchen help.
- 7. See that every man understands the time and place of assembling. Note this information on his copy of the contract.
- 8. Put one man in charge of the party and furnish him with a list of the men's names, specific written instructions for reaching the destination, and, if necessary, a map on which has been drawn the route to the fire camp.
- 9. Place all original contracts in a sealed envelope; entrust it to the bus or truck driver or man in charge, to be taken to the fire camp with the crew and delivered to the camp boss. Give duplicate copy of the contract to the employee.
- 10. Furnish lunches when trip requires more than 3 hours of travel or arrange for meals enroute.
- 11. Where mileage is to be paid for use of a personally-owned car, make sure the mileage rate is understood and furnish the camp with copy of the agreement.

Rates of Pay

Each year in advance of the fire season, the regional forester will issue a schedule of fire-fighting wage rates. The current schedule with instructions will be found in the Appendix of this chapter. No deviation may be made from the schedule.

While the rates specified in the annual schedule must not be changed, the officer in charge of the fire has authority to promote competent men through reclassification, as from laborer to faller, and to change the rate of pay accordingly.

A decrease in the rate stated in the contract cannot be made without violating the contract. On the other hand, men who have been granted increases through promotion may at any time be reduced, on notice, to the original contracted rate. If a man's services in a contracted position are unsatisfactory or if size of crew or other conditions change so that the position or rate is not justified, he must be discharged or released, or by mutual consent the original contract may be terminated and a new one drawn up.

Use of Firefighter's Contract

While the contract is specific in its provisions, it has been interpreted differently by different officers. For the sake of uniformity and fairness to everyone concerned, the following is the intent of each specific rule in order as it appears on the contract (A sample Form 106-R6 (Firefighter's Contract) appears on the following page):

FIREFIGHTER'S CONTRACT between United States Forest Service and

Name	e (print)	James	E.	Williams
		(First Name)		(Last Name)
Addr		ng) 247 A		(
	z Euger		State Ore	gon
		#1 Laborer	Point of hire	Bend, Oregon
Rate	of pay at	point of hire		d board
In c	ease of acc	ident, notify	J. W. Williams	
Addr	ess 49	2 N. E. 47th Av	enue	4
City	Port	land	State Orego	on
			SPECIFIC RULES	
1.	basis:		•	nputed on the following
	(b) Walk:			ction of forest officer. rmined by forest officer
	(c) A recover	asonable allowa r travel from p	nce as fixed by forest oint of hire to fire a 3. (Not more than 8 h	
			ling by rail, boat, a	
2.				d by the Forest Service
				as specified in clause 3.
3.	Employees I needed, and allowed rehire if the least 10 da point of hithey will I from point	being discharged without appro- turn transportates have worked to ays but less the conly and no be allowed returned for the confidence of hire.	d or quitting while the val of forest officer tion or any time allow less than 10 days. It an 20 days, they will return transportation and	neir services are still in charge, will not be wance to or from point of f they have worked at be allowed time from n; if 20 days or more, time allowance to and
4.		AND PROPERTY Com total amount		d on time slip and amounts
5.				n will be given unless
	reasonable	proof is provi	ded. All disputes abo n before accepting time	out time must be settled
6.			e responsible for pers	
7.		gree to the abo		orian proporty.
, ,		5		
Νīο			/s/ James E. Will (Empl /s/ R. B. Mason (Hiring	lliams loyee) Officer)
No		- Desirements		
		(IMPORTAN	T INFORMATION ON REVER	RSE SIDE)

R-6 F.C. Hdbk. Revised 4-20-51 No. 63

- Rule 1 (a) Interpret literally. It does not include the time of men who intentionally or otherwise become separated from their crew or become lost. Neither does it include the rest period during the lunch hour. Any lunch period of over 15 minutes should be deducted.
- (b) Compute a reasonable amount of time for the average employee, which should be merged with working time.
- (c) Travel time should be determined by the forest officer in charge on the basis of the actual walking time, plus riding time up to 8 hours per day, required for travel between the point of hire and the fire, and then kept constant for duration of the fire.
- Rule 2 In special cases where employees do not wish to return to point of hire, they may be furnished transportation and travel time to any other point, provided the cost of each of these items does not exceed that of returning them to the point of hire.
- Rule 3 "While their services are still needed" should be construed to mean for any fire-suppression work, including employment on other fires, mop-up work, or even improvement work, pending possible development of fires temporarily checked.

Exceptions to this rule may be made in the following cases only:

- 1. Employees who are injured while engaged in official work.
- 2. Local men who are sustaining unwarranted personal loss through neglect of their own business and have agreed to help temporarily or until outside help can be secured (applies to logging crews, threshing crews, road crews, and other organized crews).
- 3. Laborers who are clearly so physically deficient that the fire boss refuses to employ them (applies to boys, cripples, old men, and others of similar classification).

Men leaving on account of sickness or injury, incurred while not on official work before they have worked the required time, will not be given travel allowances or free transportation although every other possible assistance should be rendered.

Employees not entitled to free transportation back to point of hire should be furnished ample lunches up to the time they can reach a settlement, and in case they are without funds should be furnished transportation, the cost of which will be deducted from their wages. Fair treatment of men who quit or are discharged is imperative. Transportation in government trucks on regular trips may, of course, be furnished without cost to any man leaving the job. A special effort should be made to furnish transportation to sick men in government vehicles on regular trips.

Employees entitled to free transportation should be furnished subsistence enroute back to point of hire. This will ordinarily consist of lunches. However, when necessary, meals may be taken at restaurants or hotels enroute. Ordinarily, it should not be necessary to furnish lodging at hotels to employees either going to the fire or returning to point of hire, but this may be done in special cases where other means of lodging them are not available.

Rule 4 - The value of commissary issued must not exceed the amount of wages earned.

Rule 5 - While not specifically stated in the contract, this also applies to deductions. It is essential that disputes about time be settled on the ground. Foremen are responsible for turning in correct time to the time recorder each day. The employee's signature on his time report should mean that he has checked the time and deductions and accepts the net amount due as correct.

Rule 6 - A reasonable effort should be made to care for small items, but before any personal property is accepted for safekeeping, the employee's attention should be called to this rule. Also a notice should be posted: THE GOVERNMENT IS NOT RESPONSIBLE FOR LOSS OF PERSONAL PROPERTY.

Rule 7 - The new contract form does not have the certifications of age on it. Boys under 18 years of age should not be hired as laborers or other line workers, except in emergency periods or in unusual cases where sufficient other help is not available immediately; e.g., where campers, boy scout troops, or other individuals or groups are in the vicinity of a fire and can put it out or assist in controlling it pending the arrival of fire-fighting crews. In such cases and where it is desirable to hire flunkies, messengers, water boys, radio operators, and time recorders or other camp assistants who have not reached the age of 18, this is permissible.

Time Recording

Keeping Record of Time in Camp

The camp boss and time recorder must be thoroughly familiar with the rules for hiring men, fire-fighting wage rates, Form 106-R6 (Firefighter's Contract), Form FS-874-15A (Time Report), Form 875-R6 (Foreman Fire Time Book and Notebook), and Form 8-R6 (Fire-Fighting Overhead Notebook). All of this material will be found in the camp boss outfit. A complete list of contents will be found in the Appendix.

The time recorder will prepare Form FS-874-15A (Time Report) for each man, whose name must appear exactly as noted on the contract. Time will be transferred from foremen's time books to the time reports after proper audit at the close of each shift by the time recorder. Any discrepancies noted will be corrected with the foreman. On small fires the time recorder will also be responsible for direct record of time for the camp crew, foremen, scouts, and other employees with the exception of yearlong officers and regular guards. On large fires the camp boss will be directly responsible

R-6 F.C. Hdbk. Revised 4-20-51 No. 63 For the time of the camp crew. The time for packers, truck drivers, mechanics, and tool conditioners will be the direct responsibility of assistants in charge of transportation and supply, who will provide adequate methods for keeping currently accurate time records for such personnel.

To avoid confusion in timekeeping and delays in payment, time must be posted daily on the time reports and not allowed to accumulate in the foremen's time books. Time reports should be filed alphabetically in 5x8 pasteboard files.

Keeping Time on the Line

Each foreman will be required to keep a detailed time record (name and contract number) for every man in his crew. Time should be noted daily on leaving camp for the fire and on returning to camp at the end of each shift. Each foreman will be furnished two time books. One book will be turned over to the time recorder promptly on arrival at camp at the end of each shift, at which time the foreman will prepare the second time book for the succeeding day's record. Change in classification of any man should be promptly reported to the time recorder.

Transferring Men to Other Camps or Fires

When men are transferred from one camp to another on the same fire, all accrued time should be entered and time reports brought up to date, the reports being initialed by the time recorder opposite the last entries in time, commissary, and property blocks. The time recorder should note time and date the employee left the fire camp. The new time recorder will continue the man's time on this time report.

On transfer to another fire, time reports must be completed with travel allowances shown, commissary and property deductions made, net wages computed, and with all the required signatures. Time reports will be placed in a sealed envelope and entrusted to overhead in charge of the crew for delivery with the crew to the time recorder at destination. The new time recorder will check the men's time reports with their individual contracts and make out new time reports on which the men's time will be recorded while they are on that fire.

Overhead From Other Forests

Overhead assigned to project fires from other units will report directly on arrival to the camp boss and then to the head time recorder. Each man will give his name, the forest or unit whence he came, his rate of pay, the appropriation involved, and any other essential data.

Submission of Time Reports for Payment

At the option of the forest supervisor duplicate copies of time reports may be required for the district ranger files. The original time reports will be forwarded in a sealed envelope via some responsible person to the supervisor's office or, in case of field payments, to the paymaster.

Form FS-874-15A should be used for recording fire suppression time only. A separate time report must be used for each fire. Entries must be legible and made with ink or indelible pencil. There must be no erasures or alterations in actual time or reports forwarded for payment without the employee's initials opposite the change. Mechanical mistakes can be corrected without obtaining the employee's initials. Detach and destroy the stub-do not give it to the employee. The employee will be identified by his copy of the Firefighter's Contract.

The employee s full name will be entered and must be identical with his name on the contract.

"Address". Enter address for mailing the employee's check.

"Place of hire". Enter the city or place where the man's contract was made out or his employment commenced.

"Job classification" will be designated by item number as it appears on the current fire-fighting wage rate schedule.

Travel time from point of hire to the fire camp and return, if allowable, will be shown in the "Travel Time" block. Where the classification of an employee changes, return travel time to the point of hire will be shown under the classification of the last work performed. On large fires a reasonable standard travel time from point of hire to the fire should be established and used, except for special cases. Travel time between camp and fire line each day will be included in working time.

The "Working Time" block provides for only 10 days. When a longer period is involved, an additional time report marked "No. 2" should be used to continue the man's time record. Show here the hours per day worked. Time should be entered to the nearest ½ hour. A day begins at 12:01 a.m. and ends at 12:00 midnight. Do not make any entries in the "on shift — off shift" columns. Enter time as reported by foremen from Form 875-R6, Foreman Fire Time Book and Notebook, under "Hours" only.

Indicate if employee was "released, discharged, or quit" by striking out the words not applying.

Opposite "Total Time", write in the sum of hours in each job classification column at the completion of the man semployment.

Indicate if government subsisted or self subsisted by striking out "No" for the former or "Yes" for the latter. *-It is a good plan to write "Self-Subsisted" on face of Time Report to avoid overlooking this item when it applies.-

Opposite "Rate", write in the rate of pay for the classification given for that column, according to the current fire-fighting wage rates.

Opposite "Amount Earned", write in the wages as computed by multiplying "Total Time" by "Rate" for each job classification.

TIME REPORT

Clear Creek (Name of Fire)		Willam (Fore		
Name James (Full first name)	E. Tritial)	-		
Address_ 217 Alder St., Eugene,	<u>Ore</u>			
Place of hireBend, Ore	1	leans of tra	velB	us
Date : Job Classification Day-Year:	Title	; #1 L.	: #8 : F.	: #4 : CB
: Ti	me : Time	:	:	:
8/7 : To fire : On Shift:Off Shift:On S	ted : Arrived	3 _ 3	: Hours :	Hours 3 2 9
	: Total	: : :	**************************************	:
Released - Discharged Quit	: Time_	<u>: 21 </u>	<u>: 18 </u>	: 14
*With subsistence - Yes - No	: *Rate	1.05	1.85	1.60
AUTOI SUBSISSIENCE - Les Ver NO	Amount Earned	22.05	33.30	22.40
I certify that property and	: Gross A	mt. Earned	7	7.75
commissary charges and time itemized hereon are correct.	: Deducti	ons	•	4.00
/s/ James E. Williams (Employee)	Net Amo	ount Due	: :7	3.75
/s/ Samuel J. Smith (Timekeeper)			C.	28750

(See following page for reverse side of Form)

R-6 F.C. Hdbk. Revised 4-20-51 No. 63 Form FS-874-15A (Reverse Side)

INSTRUCTIONS TO FOREST OFFICERS

When the employee first reports for duty, fill in one of these forms as far down as the first double line; and also note below the number of hours for going to the fire. Fear-eff-the-stub-and-give-it-te-the-employee.

When he goes to work, enter on form the date and on same line the hour he goes "On Shift," using A and P to designate a.m. and p.m., respectively.

hour he goes "On Shift," using A and P to designate a.m. and p.m., respectively. For instance, 6:30 a.m. would be written "62A," noon as "12A," and midnight as "12P." When he quits work enter hour in the next "Off Shift" column opposite the proper date.

The day begins at 12:01 a.m. and ends at 12:00 midnight.

This form prevides—for—two—shifts—a—day.——It is to be used at FIRES ONLY. Actual time worked will be secured from crew boss to whom employee is assigned.

Once having obtained an employee's name and serial number, he need then be known by number only. These forms should be forwarded to supervisor when fire is extinguished.

Date :	Property Record	:	Charge	
8/7 8/11 :	Bed	<u>:</u>	_ <u>15.00</u> .	15.00
				•
•	Value property lost	· !	4 mill famil famil 4 miles 4	
	Amount charged			
Date :				: Charges
- <u>8/8</u> - <u>:</u> <u>8/10 :</u>	Coupon book #10 #115			2.50 2.50 5.00
8/11 :	Less coupons returned			1.00
			·	
:				
0		Total		<u> </u>
Total pro	operty and commissary deductions		\$_	4.00

"Gross Amount Earned" is the sum of all wages which appear opposite

The entry opposite "Deductions" will be the sum of commissary and property charges as shown on the reverse side of the form.

"Net Amount Due" will be the difference between "Gross Amount Due" and "Deductions".

The commissary account is an itemized list of charges against the employee for coupon books or commissary items, the total of which is deducted from wages due him. *-Coupon books (see Commissary Section) secured by an employee should be charged currently on his time report by amount and number at the conclusion of the period of employment and credit given for coupons remaining in the book, if any. Purchases of boots and like items will ordinarily be charged on time reports direct and not handled through coupon books.-*

The property account is an itemized record of tools, equipment, and bedding issued to employees to be returned by them or otherwise satisfactorily accounted for. The value of property will be entered in the charge column. When the articles are returned they will be credited at the same valuation. Any difference between "charge" and "credit" will represent value of property not returned and will be deducted from wages due.

Time reports must be completed before signatures are affixed and must not be signed in blank. Time must be accounted for and time reports signed before the employee leaves camp. Errors in time allowance, rates of pay etc., must be reported back to foremen for correction. The employee's attention should be called specifically to the fact that signing the time report constitutes acknowledgment of accuracy as to time worked and proper deductions. Printed signatures or initials are not acceptable.

Return Transportation for Men

When an employee who has failed to fulfill his contract is furnished return transportation or meals enroute, the cost should be entered with commissary on his time report and deducted from his wages. Standard transportation requests, Form 1030, must be used for all transportation on rail or other common carrier lines, whether the cost is deducted from wages or not. For rail travel the transportation request must specify "Coach Fare", which is the lowest rate. Transportation requests will seldom be kept at fire camps. Ordinarily they will be made out at the district ranger's headquarters or other central point. Forms AD-128 in some cases may be used for special bus transportation under charter.

Payment of Wages in Cash

In case an employee is urgently in need of money in an emergency, the forest officer in charge or other yearlong officer may pay him in cash for one or two days' work and secure a subvoucher, Form 1012d, for submitting with expense account, but advance payment before the work has been performed

must not be made. The subvoucher must bear the endorsement "Cash payment demanded". It must show number of hours worked by dates, and this time on identical dates must be stricken from the employee's time report; otherwise, payment on the subvoucher will be refused by the fiscal agent on the ground that the employee has already been paid for labor performed on these dates. Cash payments should be held to a minimum. Receipts must be full and complete to enable prompt reimbursement to the person making the advance.

Demobilization

At the end of the project it will be the duty of the service of supply to systematically return tools and equipment, subsistence supplies, and commissary items, submit all records and reports kept at the camp, dismantle the camp facilities, and clean up the camp site. This job should not be left for others than the fire crew to do.

Reminder List

- 1. Return interforest and central warehouse equipment.
- 2. Return forest and ranger district equipment.
- 3. Submit all records and reports to the district ranger.
- 4. Return subsistence supplies.
- 5. Close out commissary and submit records.
- 6. Dismantle all camp facilities.
- 7. Fill latrines, garbage pit, and other excavations.
- 8. Clean up camp area.
- 9. Bury or burn all refuse.
- 10. Extinguish all camp, cooking, and refuse fires.

APPENDIX

Table of Contents

Part 1 - Camp Boss Outfits

Part 2 - Camp Boss Trailer

Part 3 - Authorized Commissary Purchase List

Part 4 - Food Poisoning

Part 5 - Form FS-587, Equipment Agreement (Rental or Hire)

Part 6 - Ration Tables - One Man for One Day
Ration Table No. 1 where packing 5 miles or less
Ration Table No. 2 where packing over 5 miles

Part 7 - Fire Crew Menus

Part 8 - Rental of Private Equipment

Part 9 - Wage Rates, Fire-Fighting

CAMP BOSS OUTFITS

The following lists show forms and stationery needed in fire camps. Quantities will, of course, depend on the number of men in camp.

1. For small camps (30 men)

```
2
         Form 8-R6, Fire Fighting Overhead Notebook
         Form 106-R6, Firefighter's Contract
36
         Form AD-128, Field Purchase Order--Vendor's Invoice
         Form 289, Field Notebook
1
36
          Form FS-874-15A, Time Report
          Form 875-R6, Foreman Fire Time Book and Notebook
18 sheets Paper, carbon, 4"x61"
          Pencil, indelible
1
          Pencils, No. 2
1 copy
          Safety Code
1 copy Wage Rates, Fire-fighting
```

2. For large camps (standard 100-man camp boss outfit)

```
1
           Book, alphabetical index
 1
           Box or canvas container, with list
 2
           Crayons, lumber, blue
 20
           Envelopes, large, manila
           Envelopes, small
 20
 10 each
          Forms CA-1, CA-2, CA-16, CA-17, *-CA-20, S-69,
             R6-A10-* with instructions
 50 sets
           Form 3-R6, Subsistence Inventory and Requisition
 5 sets
           Form 4-R6, Fire Equipment Requisition and Invoice
  3
           Form 8-R6, Fire Fighting Overhead Notebook, with 200
             extra Message Forms (Sheet 15)
100
           Form 106-R6, Firefighter's Contract
  2
           Form AD-128, Field Purchase Order--Vendor's Invoice
 2
           Form 289, Field Notebook
 10
           Form FS-587, Equipment Agreement
250
           Form FS-874-15A, Time Report
 2
           Form 874-30, Hourly Wage Table
 24
           Form 875-R6, Foreman Fire Time Book and Notebook
 1
           Handbook chapter, Fire Control, Service of Supply
           Headlight or flashlight, with extra set of batteries
 10 sheets Paper, carbon, 4"x64"
 10 sheets Paper, carbon, 8"x101"
250 sheets Paper, ruled
 1 box
           Paper clips
 6
           Pencils, indelible
 12
           Pencils, No. 2
  1 box
           Rubber bands
 1 copy Safety Code
```

Part 1 of Appendix - Page 1 R-6 F. C. Handbook Part III - Chapter 4 *Amended 2-25-54 No. 81 Sign, Camp Boss, 5½"xl4", black on yellow
Signs, Fire Camp (Directional)
Sign, Garbage, 5½"xl4", black on yellow
Signs, Latrine, 5½"xl4", black on yellow
Signs, Safety
Signs, Sleeping Area, 5½"xl4", black on yellow
Sign, Timekeeper, 5½"xl4", black on yellow
Sign, Tools, 5½"xl4", black on yellow
Signs, Water, 5½"xl4", black on yellow
Signs, Water, 5½"xl4", black on yellow
Tacks, thumb
Tags, bed
Tags, linen, 2"x3"
Wage Rates, Fire-Fighting

R-6 F.C. Hdbk.
Part III - Chapter 4

Part 1 of Appendix - Page 2

Revised 4-20-51 No. 63

CAMP BOSS TRAILER

Timekeeping Outfit

1 25 25 2 2	Book, alphabetical index Envelopes, Manila, large Envelopes, small Erasers, rubber
20 each	File boxes, 5"x8" Forms CA-1, CA-2, and CA-16, Bureau of Employees' Com-
	pensation, with instructions
10	Form CA-17, *-CA-20, S-69, R6-A10-*, Bureau of Employees' Compensation
200	Form 100-R6, Firefighter's Contract
- 800-	Form FS-871-15A, Time Report
-80-	Form 875-R6, Foreman Fire Time Book and Notebook
2	Handbook chapter (Fire Control), Service of Supply
200 sheets	Paper, carbon, pencil, $4"x6\frac{1}{4}"$
10 sheets	Paper, carbon, pencil, 8"x102"
25 sheets	Paper, letter-size
1 box	Paper clips
8	Pencils, indelible
18	Pencils, No. 2
l box	Rubber bands
-2-	Stapler, paper, with extra staples
4	Wage Rates, Fire-Fighting
4	Wage Tables, Hourly

Camp Boss Outfit

1 4	Axe, hand, with sheath Bags, sleeping, goosedown Box, tool
î	Bucket, canvas
4	Chairs, folding
2	Clip boards
4	Cots, folding
2	Crayons, lumber
2	Flashlights, with extra sets of batteries
1	Fly, canvas
50	Form 3-R6, Subsistence Inventory and Requisition
10	Form 4-R6, Fire Equipment Requisition and Invoice
6	Form 8-R6, Fire Fighting Overhead Notebook
400	Form 8-R6, Sheet No. 15, Message Blanks
2	Form AD-128, Field Purchase Order
4	Form 289, Field Notebook
20	Form FS-587, Equipment Agreement
1	Hammer, claw
1	Kit, First Aid, large

Part 2 of Appendix - Page 1 R-6 F. C. Handbook Part III - Chapter 4 *Amended 2-25-54 No. 81

```
1
             Lantern, electric
  2
             Lanterns, gasoline, with extra mantles and generator
  1
             Machine, duplicator, with 4 duplicator sheets (Hectograph),
                pencils and ink
             Maps, \frac{1}{4}" base (for each forest served)
  4 pads
             Message forms, radio
l bag Nails, assorted
200 sheets Paper, "Ditto" (for Duplicator)
             Paper, writing, ruled
  2 pads
             Pliers, slip-joint
  l pair
200 feet
             Rope, z-inch
             DELETED
             Screwdriver
  1
             Shovel, No. 0
 10
             Sign cards, blank
             Signs, Camp Boss, 5\frac{1}{2}"xl\u00e4", black on yellow
  144
             Signs, Sleeping Area, 52"xll;", black on yellow
             Signs, Car Parking
  2
             Signs, Drive Slow
 10
             Signs, Fire Camp (directional)
             Signs, Garbage, 5\frac{1}{2}"xll4", black on yellow Signs, Latrine, 5\frac{1}{2}"xll4", black on yellow
  24
             Signs, Government Not Responsible for Loss of Personal
                Property
  2
             Signs, Stop
             Sign, Timekeeper, 5½"xll,", black on yellow Sign, Tools, 5½"xll,", black on yellow
  1
  4
             Signs, Truck Parking
  2
             Signs, Wash Rack
Signs, Water, 5\frac{1}{2}"xll4", black on yellow
  2
  1 .
             Table, folding, small
             Tacks, thumb
Tags, linen
 24
250
  1
             Telephone, field, with extra batteries #950
             Twine
  l ball
100 feet
             Wire, telephone, emergency
```

R-6 F.C. Hdbk.
Part III - Chapter 4
*Deleted 4-3-52
No. 67

Part 2 of Appendix - Page 2

AUTHORIZED COMMISSARY PURCHASE LIST

Blades, safety razor, double-edge Brushes, tooth Candy bars, 2 brands Cigarettes, 3 brands Combs Cream, shaving Gloves, cotton work Gum, 2 brands Handkerchiefs, bandana Papers, cigarette, white Paste, tooth Pipes, corncob Razors, safety, double-edge Shirts, work Shorts Snuff Soap, toilet Socks Tobacco, chewing Tobacco, smoking, 3 brands Towels, hand Undershirts (Shoes and overalls will not be stocked but may be specially ordered)

> Part 3 of Appendix - Page 1 R-6 F.C. Hdbk. Part III - Chapter 4 Revised 4-20-51 No. 63

FOOD POISONING

Outbreaks of diarrhea in fire camps are often attributed to soap left on dishes and cooking utensils. This may be directly responsible for some outbreaks, but food poisoning is the contributing factor in most cases.

Kinds of Food Poisoning

- 1. Food infection. Caused by eating food containing bacteria.
- 2. Food intoxication. Caused by eating foods containing toxins produced by contaminating bacteria which grow in the food. After the toxin is produced, it is not destroyed by ordinary cooking or boiling.
- 3. Chemical food poisoning. Caused by contamination of food by poisonous chemicals such as insect powders.

Prevention of Food Poisoning

- 1. Purchase only sanitary food from reliable sources.
- 2. Do not use cooking utensils having open, hard to clean seams.
- 3. Sanitize all eating and cooking utensils after washing, with water above 170° F, or use a warm (not hot) water rinse containing 1 tablespoon of Clorox or similar chlorine solution per gallon of water. Do not dry dishes with a towel.
 - 4. Store utensils in a clean place and keep them covered.
- 5. Refrigeration All perishable foods should be stored at 50° F or less, if practicable.
 - 6. Keep all food covered and protected from dust and flies.
- 7. Food handlers must be clean and free of communicable diseases or infected sores.
- 8. Keep camp area free of all wastes, garbage, and sewage to prevent the attraction of flies and rodents.
 - 9. Be sure of a safe water supply.

(Sample) UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE

EQUIPMENT AGREEMENT

(RENTAL OR HIRE)

	Date _	July 15	, 1951
The undersigned _Elmer_E_ Ball	wner)	arkdale, Oregon (Address)	
hereby agrees to rent or hire to the Forest Se			
Oregon	the following	g described equipment a	t the rate(s)
specified; payable At. termination of se (Monthly, quarterly, etc.)	rvice		
2 pack mules, fully equipped inclu	ding pack saddles, sa	ddle bags, halters.	2
saddle blankets, and pads			
Plymouth 3/4-ton pickup			
	Rate, \$.07	per mile	
Purpose: For transporting supplies i	n fighting the Bear C	reek Fire	*************
Included in consideration Government assequipment is in use. Major repair owner's negligence will be finance	e due to faulty mater	ride many ow has lair	מס מ
animals and keep them shod while i *Risk of loss, damage, or destruction of hired	n use. Gasoline and equipment assumed by Fo	oll furnished by go rest Service No ((Insert "Forest Service" or "owner"	overnment.
owner's negligence will be finance (For autos, whether gasoline and oil is furnished animals and keep them shod while i *Risk of loss, damage, or destruction of hired will be paid for damage, loss, or negligence of the owner. Any clai assumes risk of all loss, damage, or destruction, show the extent of r	destruction due to or ms will be considered isk assumed by each)	dinary wear and tea under applicable regulation	r or laws and tions.
*Fill in information on reverse if risk is assume			
Approximate period (subject to available app	propriations): FromInd	efinite to	
Terminable by either party in accordance win No Member of or Delegate to Congress and either before or after he has qualified, a share or part of this contract or agreement, of contained shall be construed to extend to a made for the general benefit of such incorpora	or Resident Commissione and during his continuance or to any benefit to arise the my incorporated company, ttion or company. (41 U.S.	in office, shall be admereupon. Nothing, how where such contract or a . C. sec. 22, and 18 U. S.	itted to any vever, herein agreement is C. sec. 199.)
Owner _/s/ Elmer E. Ball (Signature)	Officer /s/ K	arl C. Langfield (Signature)	
	TitleD	istrict Ranger	
FS-587 (Rev. Jan. 1948) (See 1	reverse side for back	of form)	16—21171-8

Part 5 of Appendix - Page 1 R-6 F.C. Hdbk. Part III - Chapter 4 Revised 4-20-51 No. 63

DESCRIPTION AND VALUE OF ANIMALS, VEHICLES, AND/OR OTHER HIRED EQUIPMENT

(To be filled in only when Government assumes all or partial risk of loss, damage, or destruction)

ARTICLE	AGE (Or year of manu- facture)	DATE ACQUIRED BY PRESENT OWNER	Cost to PRESENT OWNER	APPRAISED VALUE	REMARKS (Defects, conditions, brands, etc.)
One Mare Mule named Betty	5 years	3/15/50	\$150.00	\$160.00	Wire cut scar left front thigh. Good cond.
One Mare Mule named Sally	5 years	4/10/49	\$140.00	\$130.00	Scar mark right shoulder.Fair condition
2 Pack saddles	1947	1947	\$ 50.00	\$ 25,00	Equipment in
2 pr. Saddle bags	n n	11	\$ 40.00	\$ 20.00	good_condition
2 Halters		11	\$ 8.00	\$ 4.00	but shows
2 Saddle blankets	т	11	\$ 12.00	\$ 6.00	considerable_wear.
2 pr. Saddle pads	<u>n</u>	11	\$ 18.00	\$ 9.00	
Plymouth _3/4-ton_pickup	1949	1949	\$1400.00	\$1100.00	Good.condition

Note.—Risk of loss, damage, or destruction to rented buildings or quarters will not be assumed by the Forest Service.

U. S. GOVERNMENT PRINTING OFFICE 16-21171-2

Part 5 of Appendix - Page 2 R-6 F.C. Hdbk. Part III - Chapter 4 Revised 4-20-51 No. 63

RATION TABLES

In using the following tables, refer to the instructions under "Subsistence Supplies". For convenience the No. 2 or $2\frac{1}{2}$ can is used in all tables as a unit for canned vegetables and fruits and the No. 1 can for jam and milk. Fruit for lunches should be purchased in 8-ounce cans, the number of cans given in the tables being increased as needed. For large camps, vegetables and fruits should be ordered in No. 10 cans, using a ratio of one No. 10 can to four or five No. 2 or $2\frac{1}{2}$ cans. Cheese should ordinarily be obtained in two- and five-pound bricks. Sacked goods should never be ordered in larger than fifty-pound sacks unless it is known that they will not have to be packed. The authorized grade for most canned fruits and vegetables is "Standard". Higher grades should not be bought except when "Standards" are not obtainable.

	Ra	ti	on	T	ab	ole) a	19010	Or	ne	Ma	m	fo	or	Or	10	Da	ıy									
Balanced ratio	n,			4		T ₀															I.V						
one man one da	y																	ļ.								Amor	mt
Baking powder	0	0	•	0	0	0	0	0	0	0	0	0	0	0				0	•			•				.04	lb.
Beans	0	0	0	0	0	0	D			0	•		0	•	0	0			•	•	0	•		0		.2	lb.
Bread	0		•	0	0	0	01	0	•	•	•	٥	0	0	0	0	•		0	0						1.00	lb.
Butter	0	0	0	0	0	•	0		•		0	•		0	0		0	0	0	0	0			0		.12	lb.
Canned fruit.	0	•	0	0	•	•	0	0	0	•				•	٥	0		0	0	•		۰	0	0	0	1/4	can
Cheese	o	0	0	0	٥	0	0	0		•	0-	0		0	0		0	0			0			0		.06	lb.
*Cinnamon	0	0		o	•	•	0		0	0	0	•		•			٥		0		0	٥		0	0	.04	oz.
Coffee	0	0	0		0	0	۰	0	0	•	•		•			0	0		0		0	0	0	•		.13	lb.
*Cornstarch	0	•	0	0	0	•	0	0	•	•	•	0	0	•	0	•	•		0	0	0		0	œ	0	.02	lb.
Dried fruit .	0	0	0	•	0	0	0	•	0	0		0	0		0	0		0		•	0	•				.1	lb.
*Extracts	0	0	0	o	0	0		0		0	0		•		•	0	•				0		0	•		.03	oz.
Fresh meats .	o.	0	•		٥.	o	0	o			6	0							•	•				0		1.50	lb.
Fresh vegetabl																										.35	lb.
Lard					•		•	•											•	•				0		.1	lb.
Matches																											
Milk (canned)			6	•					•						•				0		0			•	0	1/3	can
Oatmeal	0				0											•					0	0		•		.15	lb.
Pepper		•		•					•												0					.06	oz.
*Pickles	0			0	0		•	0	0		0		•				٥	0	0	٠	•	0	0	•		1/15	pt.
Potatoes	0	•	0	•					•								0		•		0		0	•	0	1.00	lb.
Salt	0	•	0	•	•	•	•	۰				0		•	0			0	0	0	0	0	0	0		.04	lb.
Soap																											
Sugar	•	•		0	٥		0	•	0	0					0		0		٥		•	0				.4	lb.
*Syrup	0	0	0	0	0	0	0	0	•	0	0	•	0	•	0	6	0	0	0					ø		1/12	pt.
																	To	ta	1	We	įįe	ght	t			6.00	lbs.

*Essential only in large camps

Part 6 of Appendix - Page 1 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No new instructions No. 63

Ration Table No. 1
(To be used along roads or where packing 5 miles or less)

	Fi	re -	Da	y Rat	ions For:			
Authorized Items	Unit	t A :	t B Men	List C 50 Men List D 100 Men	Authorized Items	Unit	List A	List B 25 Men List C 50 Men List D 100 Men
Beverages Cocoa Coffee Tea Cereals	lb. lb. lb.	ייןמס און יי	1 15 ½	2: 3: 30. 60. 1. 2	Relishes and Extracts Catsup Extract, lemon or vanilla Pickles Vinegar	:btl.oz.	: 1 : 1 : -	: 5: 10: 20: 4: 8: 16: 5: 10: 20: 2: 4: 8:
Oatmeal, farina, or cornmeal Rice Dairy Products Butter Cheese Eggs Milk, tall Flour Pancake	:lb.:lb.:doz.:can	41 3269	18 5 15 8 30 48	9: 18: 30: 60: 15: 30.	Spices Cinnamon, nutmeg Pepper Salt Sugar and Syrup Sugar Syrup Vegetables, Bulk Beans (dry), lima, navy,	oz. oz. lb.	10	4: 8: 16: 8: 16: 32: 5: 10: 20: 50: 100: 200: 5: 10: 20: 5: 10: 20: 5: 10: 20: 5: 10: 20: 5: 10: 20: 5: 10: 20: 5: 10: 20: 5: 10: 20: 5: 10: 20: 5: 10: 20: 5: 10: 20: 5: 10: 20: 5: 10: 20: 1
White Fruit, Canned Peaches, pears, berries pineapple Fruit, Dried Apples, apricots, peaches, prunes or raisins Fruit, Fresh	can	: 4	25 20 10		or red Beets Cabbage Carrots Onions, dried Potatoes Vegetables, Canned Corn, peas, string beans, spinach, tomatoes	lb. lb. lb. lb. lb.	: 5 -2 2 :25 :4	25: 50:100: 3: 6:12: 7: 14: 24: 5: 10: 20: 5: 10: 20: 100: 200: 400:
Apples, lemons, oranges, plums Jam, Canned Leavening Baking Powder Soda Meats and Shortening Fresh meat Bacon Lunch Meat Ham, smoked Shortening (2 ration, use bacon grease)	lb. lb. lb. lb. lb. lb. lb.	3 3 - 1 :15 4 4 4 2	15 15 2 1 75 20 8 20	30 60 4 8 2 4 150:300	Miscellaneous Bread Chloride of lime Cornstarch Macaroni Matches Peanut butter Sacks, paper, 8x Soap, hand " laundry Tapioca Toilet paper Washing powder	lb. can lb. lb. box lb. ea. bar bar lb. rol	: 1 : - 3	120 240 480 4 8 16 3 6 9 15 30 60 5 10 15 3 6 9 250 500 1000 8 12 24 3 6 12 2 4 8 5 10 20

Ration Table No. 2

		packing over 5 miles)	I K	
		Rations For:		
Authorized Items	Unit List A 5 Wen List B 25 Men List C 50 Wen	Authorized Items	Unit	List A 25 Men 25 Men 25 Men List C 50 Men List D List D List D List D List D
Beverages	: : : :	: Relishes and Extracts (Cont.)	:	: : : : :
Cocoa Coffee Tea	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3: Pickles 60: Spices Cinnamon nutres	:qt.	
Cereals	10. : 4 : 2 : 1 :	2 Cinnamon, nutmeg Pepper	oz.	- 4. 8. 16 2 8 16 32
Oatmeal, farina, commeal Rice		72 Salt 18 Sugar and Syrup	1b.	2 8 16 32 1 5 10 20
Dairy Products Butter Cheese	lb. : 3 :15 :30 : lb. : 2 : 8 :15 doz. : 6 :30 :60 :	: Sugar 60 : Syrup 30 : Vegetables, Bulk	:lb.	. 1 . 5. 10. 20.
Eggs Milk, tall	doz.: 6:30:60: can: 9:48:96:	120: Beans(dry), lima, navy, red 192: Beets	lb.	5 25 50 100
Pancake White	lb. 5 - 25 50	Cabbage Carrots Onions, dried Potatoes	lb. lb. lb.	: 2 : 7: 14: 24: 2 : 5: 10: 20: 1 : 5: 10: 20: 25: 100: 200: 400:
Peaches pears pineapple		Vegetables, Canned	:	: : : : :
Peaches, pears, pineapple, berries	can: 2:9:18:	paracii	can	4 18 36 72
Fruit, Dried		Miscellaneous		
Apples, apricots, prunes, raisins, peaches Fruit. Fresh	lb. 4 20 40	80 Chloride of lime	can	
Apples, lemons, oranges	lb. 2 10 20	. Cornstarch 40. Macaroni	:lb.	: - : 3: 6: 9: : 3 : 15: 30: 60:
Jam		60 Matches	.box	1 . 5. 10. 15.
Leavening		Peanut butter Sacks, paper 8x	lb.	$\frac{1}{2}$ 3 6 9 $\frac{1}{2}$ 250 500 1000
Baking Powder Soda	lb: : i : 2 : 4 :	8: Soap, hand	bar	: 2 : 8: 12: 24:
Meats and Shortening		4: Soap, laundry Tapioca	bar lb.	5 / 8
Bacon	lb. 6 35 70	140: Toilet paper	roll	1 . 5 . 10 . 20
Ham, smoked Lunch Meat Shortening $(\frac{1}{2}$ ration, use	lb. 10 45 90 1 lb. 4 8 16 : lb. 2 8 16 :	180: Washing powder 32: 32:	pkg.	: 1: 2: 4:
bacon grease)	: : : :			
Relishes & Extracts Catsup Extract, lemon or vanilla	otl. 1 5 10 .	20: 16:		

FIRE CREW MENUS

The following fire crew menus, numbered 1 to 12, have been designed to prevent waste of food and insure the preparation of wholesome meals. Tests indicate they will satisfy hard-working fire fighters, both as to quantity and quality.

The menus may be used as follows:

- 1. For placing an order with the local grocer for the items needed for one menu for the number of servings selected. For instance, in menu No. 1, 25 lbs. of beef will be needed to serve 100 men. Each box or package should be suitably marked.
- 2. For placing an order with one or more firms for several units each, to be put up and packed separately. Each package and box should be suitably marked so each menu can be identified when it reaches the fire camp. Those in charge will need to insist that the cooks use only the menu selected for the particular meal.
- 3. For grouping together in a consolidated order to be obtained from one or more firms. The menus and number of servings for several meals would be decided in advance and amounts of the various items added together and posted on Form No. 3-R6, "Subsistence Inventory and Requisitions." Some adjustments would be necessary to obtain standard packages for instance if 22 cans were needed, a case of 24 cans would be ordered. When the supplies reach the ranger station, base camp, or fire camp, they will need to be divided by individual menus to insure proper usage.
- 4. For use in ordering hot meals from a commercial restaurant or crew cookhouse when the meals are to be transported in hot food containers via a pickup or dropped from an airplane to fire fighters on the line. The market list facilitates obtaining an estimate of meal cost and sometimes competition when ordering from restaurants.

Dinner or Supper

Time Required to Prepare: 1 hour if meat ground; 2 hours if meat in cubes.

Menu	: Market : List	: 25 :Servings		: 100	: 150 :Servings	Remarks
Meat and Vegetable Stew Based on 1½C. per serving	Beef Flour Fat Carrots Onions Celery Turnips Potatoes Peas Tomatoes	$1\frac{1}{2}$ lb. 4 lbs. 1 #2 can	5 lbs. 2 lbs. 2 bunche 3 lbs. 8 lbs. 2 #2 cns	2 lb. 3 lbs. 10 lbs. 4 lbs. 54 bunche 6 lbs. 16 lbs. 1 #10 cr	2 lb. 4 lbs. 15 lbs. 6 lbs. s 4 bunches 9 lbs.	Meat should be pounded before cutting. Cut in 1" cubes, or ground. (Optional)Tops only; may substitute potatoes).
Cabbage and Carrot Slaw Prunes	Salt Pepper	2-lb.cn 8 oz.cn lt 2 oz.btl 3½ lbs. 2 lbs. ½ lb. s- l pt.	2-lb.cn 8 oz.cn 2 oz.btl 8 lbs. 4 lbs. 1 lb. 1 qt.	2-lb.cn 8 oz.cn 1 2 oz.bt: 12 lbs. 6 lbs. 2 lbs. 2 qts.	2-lb.cn 8 ox.cn 1 2 oz.btl 25 lbs. 8 lbs. 3 lbs. 3 qts.	Use instead of celery if desired 3/4 C. to 1 C. Serving Refer to back for recipe to make & market list. May substitute peaches.
Bread Butter	Bread			15 loaves		s $1\frac{1}{2}$ lb. loaves 4 sls. person; 24 sl. to loaf.
Apple butter	Apple but	ter 2 lbs.	3 lbs. 4 lbs.		10 lbs. 12 lbs.	No. of cans de- pends on wt.
Coffee	Coffee	1 lb.	2 lbs.	4 lbs.	6 lbs.	50 Cs 1 lb.
Milk	Milk	2 cans	4 cans	8 cans	12 cans	
Sugar	Sugar	8 oz.	1 lb.	2 lbs.	3 lbs.	

(Recipes on back of page)

Part 7 of Appendix - Page 2 R-6 F.C. Hdbk. Part III - Chapter 4 *Revised 4-20-51 No. 63

MEAT & VEGETABLE STEW

Beef	25 Servings 8 lbs.	50 Servings 15 lbs.	100 Servings 150 Servings 25 lbs. 40 lbs. Cut in 1" cubes
peer	8 IDS.	TO TOS.	or grind
Flour	1½ C.	3 C.	5 C. 6 C. Use to dredge meat
Fat	1 C.	2 C.	3 C. 4 C.
Carrots	2½ lb.	5 lb.	10 lb. 15 lb. Slice or cut in half
Onions	1 lb.	2 lbs.	4 lbs. 6 lbs. Peel & quarter
Celery	1 bunch	2 bunches	4 bunches 4 bunches Use tops &
			Stock
Turnips	$1\frac{1}{2}$ 1b.	3 lbs.	6 lbs. 9 lbs. May use potatoes
Potatoes	4 lbs.	8 lbs.	16 lbs. 24 lbs. Dice or quarter
Peas	1 #2 can 2	2 #2 cans	1 #10 can 1 #10 & 2 #2
Tomatoes		$2 \# 2\frac{1}{2} $ cans	1 #10 can 1 #10 & 2 #2 $\frac{1}{2}$
Salt	₹ C.	₹C.	1 C. 1-1/2 C. To taste
Pepper	1 t.	.2 t.	4 t. 2 T. To taste
Celery salt	2 t.	4 t.	3 T. 4 T.

1. Melt fat in frying pan.

2. If meat is cut in 1 cubes, dredge in flour. (Place flour in paper sack and a small amount of meat at a time, and shake.)

3. Brown meat - place in kettle, cover with water - let simmer 1 hour.

4. Start all raw vegetables to cook in separate container. Add portion of salt. Cover with water.

5. Combine meat and vegetables (both cooked and canned).

6. Thicken liquid with flour (about 3/4 C. for 25 servings, etc.)

May be served with steamed rice.

CABBAGE AND CAR	ROT SALAD			
Cabbage	4 lbs.	8 lbs.	17 lbs.	25 lbs. 3/4 to 1 C.
Carrots	2 lbs.	4 lbs.	6 lbs.	8 lbs. per serving.
Onion	1/2 lb.	1 1b.	2 lbs.	3 lbs.
Salad dressing	1 pt.	1 qt.	2 qts.	3 qts.
Salt	2 t.	4 t.	1½ T.	3 T.

- Shred cabbage, carrots and chop onion finely.
 Add salad dressing just enough to combine.
- 3. Add salt to taste. Caution: may not need all called for if homemade dressing is used.

COFFEE - 50 Cups

1. 2-1/2 gal. fresh boiling water.

- 2. Add 1 1b. coffee in a cloth bag (may be soaked in cold water to cover).
- 3. Bring to boiling point let stand at this temperature about 10 min.

SALAD DRESSING FOR VEGETABLE SALAD

l can evaporated milk

3/4 C. vinegar or lemon juice

la t. salt

3 to sugar - or 6 To corn syrup

All measurements are level
T - tablespoon
t - teaspoon
C - cup

Add seasonings to vinegar - combine with milk. Yield - 1 pt. enough for 25 servings.

Part 7 of Appendix - Page 3 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No New Instructions No. 63

Dinner or Supper

Time Required to Prepare 1 Hour

	: Market	: 25	: 50	: 100	: 150	•
Menu	: List	:Servings	:Servings	:Dervings	:Servings	: hemarks
More	Beef(ground) Butter Onions Spaghetti Tomatoes Peas	6 lbs. 1 lb 1 lb 1 lb 1 lb 1 lb 1 lb 5#2 cns 5 #2 cns	12 lbs. 12 lb. 3 lbs. 3 lbs. 3#10 cns 2#10 cns	24 lbs. 3/4 lb. 6 lbs. 6 lbs. 6#10 cns 4#10 cns		Based on 2 C. per person.
(Optional)	Pimentoes Olives, ripe Cheese Corn Salt Pepper Cornflakes	3 cans 2#1 cns 2½ 1bs.	6 cans 4 #1 cns 5 lbs. 6 #2 cns 1 box 1 can 1 pkg.	9 cans 8 #1 cns 10 lbs. 12#2 cns 1 box 1 can 1 pkg.	18#2 cns 1 1 box	
Carrots, raw	Carrots, raw	2½ lbs.	5 lbs.	10 lbs.	15 lbs.	
Cooked	" (canned)	1 #10 cn	2 #10 cns	4#10 cns	6#10 cns	
Pickles, or relish	Pickles, or relish	2 qts.	1#10 can	2#10 cns	3#10 cns	
Peaches	Peaches, sliced	2#10 cns	4#10 cns	8#10 cns	12#10 cns	
	Cookies, or Graham crax.	5 doz.	10 doz.	20 doz.	30 doz.	
Bread	Bread	4 loaves	8 loaves	16 loaves	24 loaves	4 sl. person la lb. loaf 24 sl. per lf.
Butter	Butter	2 lbs.	3 lbs.	6 lbs.	9 lbs.	ed prober mo
Jam	Jam	2 lbs.	4 lbs.	8 lbs.	12 lbs.	
Coffee	Coffee	1 lb.	2 lbs.	4 lbs.	6 lbs.	50 C1 lb.
Milk	Milk	2 cans	4 cans	8 cans	12 cans	
Sugar	Sugar	2 t. per man-8 oz	1 lb.	2 lbs.	3 lbs.	

^{*1} When #10 cans are not available, use 3 $\#2\frac{1}{2}$ cans.

Rationing for Sugar:

2 t. per meal - 1 C. per 25 serv.

2-1/3 T. per day per man - 8 oz,

per week.

Part 7 of Appendix - Page 4 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No New instructions No. 63

^{*2} Olives add to appearance - but are an expensive addition.

MORE	25 Servings	50 Servings	100 Servings	150 Servings (Yield 2 C. per serving)
Beef, ground Butter Onions	6 lbs. 1 lb. 1 lbs.	12 lbs. 12 lbs. 13 lbs.	24 lbs. 3/4 lb. 6 lbs.	36 lbs. 1 lb 2 C1 lb. 9 lbs.
Spaghetti Tomatoes Peas	$ \begin{array}{c} 1_{\overline{2}} \text{ lbs.} \\ 5 \#2_{\overline{2}} \text{ cans} \\ 5 \#2 \text{ cans} \end{array} $	3 lbs. 3 #10 cans 2 #10 cans	6 lbs. 6 #10 cans 4 #10 cans	9 lbs. 9 #10 cans 6 #10 cans
Pimentoes(Op.) Olives, ripe(Op Am. cheese	3 cans	6 cans 4 #1 cans 5 lbs.	9 cans 8 #1 cans 10 lbs.	15 cans 12 #1 cans 15 lbs.
Corn Salt Pepper Cornflakes (if	3 #2 cans 2½ T. 3/4 t.	6 #2 cans 5 T. 1½ t. 6 C.	12 #2 cans 10 T. 3 t. 3/4 lb.	
baked)	5 0.	0 0.	3/4 10.	T TO*

Note: Amount for 25 servings yields 15 qts.

- 1. Melt butter in large frying pans and brown chopped onions.
- 2. Add ground beef cook until done stir frequently.
- 3. Cook spaghetti in boiling salted water.
- 4. Drain spaghetti add the meat.
- 5. Add tomatoes, peas, corn, olives & pimentoes. (Chop pimentoes).
- 6. Mix well. Add grated cheese. Stir again. Place in large baking pans. Sprinkle with cornflakes. Bake in hot oven (400°) for 30 minutes, or until it bubbles.
- Note: This may be heated in kettle set in pan of hot water like a double boiler. Use coffee can lids with holes punched in for support of kettle. "More" is excellent prepared the day before it is served then heated on day it is used. This blends the flavors.

COFFEE - 50 Cups

- 1. $2\frac{1}{2}$ gal. fresh boiling water.
- 2. Add 1 lb. coffee in cloth bag (may be soaked in cold water to cover)
- 3. Bring to boiling point let stand at this temperature about 10 min. Do not boil.

All measurements are level

T - tablespoon

t = teaspoon

C - cup

Part 7 of Appendix - Page 5 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No. 63 No new instructions

Dinner or Supper

Time Required to Prepare 2 hours

	: Market : List	: 25	: 50 :Servings	: 100 :Servings	: 150 :Servings	: :Remarks
						Water charge
Corned Beef Hash	Corned Bee	f 8 cans	16 cans	32 cans	48 cans	1220zor#1
	Potatoes	21 lbs.	42 lbs.	80 lbs.	120 lbs.	A.P.
	Carrots	8 lbs.	16 lbs.	32 lbs.	45 lbs.	
	Onions	la lbs.	3 lbs. 1 lb.	6 lbs. 2 lbs.	9 lbs.	Outdonel
	Grn.Peppe	3/4 lb.	$1\frac{1}{2}$ lbs.	3 lbs.	3 lbs. 5 lbs.	Optional Use bacon
	Bacon	1½ 1bs.	3 lbs.	6 lbs.	9 lbs.	dripping
	Salt	1 lb.	1 lb.	1 lb.	1 1b.	if avail.
Cabbage slaw	Cabbage	5 lbs.	10 lbs.	20 lbs.	30 lbs.	
	Dressing, salad or	1 qt.	l½ qt.	3 qts.	1 gal.	
	canned mi	lk 1 can	2 cans	4 cans	6 cans	
	Lemons	2 lemons	s 4 lemons	8 lemons	1 doz.	
	Vinegar Salt	l qt.	1 qt.	l qt.	1 qt.	
	Sugar or Corn Syru	l pt.	1 pt.	1 pt.	1 pt.	
Bread	Bread, rai & w.wheat	sin 4 lvs.	8 lvs.	16 lvs.	24 lvs.	any kind avail.; 3
Butter	Butter	2 lbs.	4 lbs.	6 lbs.	10 lbs.	sls.person; 1½ lb.lvs. 24 sl.to lf.
Jams	Jam	2 lbs.	4 lbs.	8 lbs.	12 lbs.	24 51,00 11.
Mixed Fruit (Pears, Peaches Cherries)	Pears Peaches Cherries	3#2½ cns 3 " " 1 " "	1#10 cn 2. " " 1#2½ can	2#10 cns 3 " " 1#10 can	3#10 cns 4 " " 2 " "	sliced Royal Anne
Coffee	Coffee	1 1b.	2 lbs.	4 lbs.	6 lbs.	50 C1 1b.
Milk	Milk	2 cans	4 cans	8 cans	12 cans	
Sugar	Sugar	8 oz.	1 1b.	2 lbs.	3 lbs.*	

(Recipes on back of page)

Part 7 of Appendix - Page 6 R-6 F.C. Hdbk. Part III - Chapter 4 *Revised 4-20-51 No. 63

CORNED BEEF HASH

	25 Servings	50 Servings	100 Servings	150 Servings (Yield: 1 C.
				per serving)
Corned Beef	8 cans	16 cans	32 cans	48 cans
Potatoes	21 lbs.	42 lbs.	80 lbs.	120 lbs.
Carrots	8 lbs.	16 lbs.	32 lbs.	45 lbs.
Onions	1을 1b.	3 lbs.	6 lbs.	9 lbs.
Green Pepper	s \frac{1}{2} lb.	1 1b.	2 lbs.	3 lbs. Optional
Lard, or	3/4 C.	$1\frac{1}{2}$ C.	3 C.	5 C.May need more fat
Bacon	$1\frac{1}{2}$ lb.	3 lbs.	6 lbs.	9 lbs.
Salt	1 lb.	1 lb.	1 lb.	1 lb.

- 1. Cut bacon in small pieces. Brown in skillets (or may use lard).
- 2. Brown corned beef in fat.
- 3. Cut vegetables in small cubes or grind in food grinder using coarse blade. Add salt.
- 4. Start cooking in fat. Combine with corned beef and cook until done.

CABBAGE SLAW

Sugar

Cabbage	5 lbs.	10 lbs.	20 lbs.	30 lbs.
Dressing, Pre-	1 pt. to	$l^{\frac{1}{2}}$ qts.	3 qts.	l gal.
pared or	3 cups			
Canned Milk				
Lemon Juice				
or				
Vinegar				
Selt.				

- 1. Shred cabbage. Add dressing and salt to teste. Use just enough dressing to combine.
- 2. If dressing is made - Combine canned milk, salt, sugar, and either vinegar or lemon juice

COFFEE - 50 Cups

- 1. 2-1/2 gal. fresh boiling water
- 2. Add 1 lb. coffee in cloth bag (may be soaked in cold water to cover)
- 3. Bring to boiling point let stand at this temperature about 10 min.

All measurements are level

T - tablespoon
t - teaspoon
C - cup

Part 7 of Appendix - Page 7 R-6 F.C Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No. 63 No new instructions

Dinner or Supper

Time Required to Prepare -*1 hour if limas are soaked.

3 hours if dry limas are used.*

Menu	: Market : List	: 25 :Servings	: 50 :Servings	: 100 :Servings	: 150 :Serving	: Remarks
Ham Succotash	Ham Corn Lima Beans (Dry)	8 lbs. 1#10 can 3 lbs.	16 lbs. 2#10 cns 6 lbs.	32 lbs. 4#10 cns 12 lbs.	6#10 cns	May be increased Use tenderized ham
	Salt Pepper	l pkg. l can	l pkg. l can	l pkg. l can	l pkg. l can	
Steamed po- tatoes	Potatoes	7 lbs.	14 lbs.	28 lbs.	42 lbs.	White med., AP 4 - 1 lb.
Tomatoes, raw, sliced or	Tomatoes	7 lbs.	14 lbs.	28 lbs.	42 lbs.	
Canned	raw or canned	2#10 cns	4#10 cns	8#10 cns	12#10 c	ns
Onions, sliced	Onions Vinegar	4 lbs. 1 pt.	8 lbs.	15 lbs. 2 qt.		
Applesauce	Apples, can Apples, fres dehy- drated		2#10 cns 2 pecks 6 pkgs.		6#10 cm 1½ bu. 18 pkgs.	
	Sugar or corn syrup Nutmeg	l lb. l qt. l can	2 lbs. 2 qts. 1 can	3 lbs. 1 gal. 1 can	8 lbs. l ¹ / ₂ gal. l can	Omit if can- ned apples are used
Bread	Bread	4 lvs.	8 lvs.	16 lvs.	24 lvs.	l½ lb. lvs.; 24 sl. to lf.
Butter	Butter	2 lbs.	4 lbs.	6 lbs.	10 lbs.	4 sls. person
Jam	Jam	2 lbs.	4 lbs.	8 lbs.	12 lbs.	
Coffee	Coffee	1 lb.	2 lbs.	4 lbs.	6 lbs.	50 C-1 1b.
Milk	Milk	2 cans	4 cans	8 cans	12 cans	
Sugar	Sugar	8 oz.	1 1b.	2 lbs.	3 lbs.	

Note: If fresh apples are used for sauce, 1 to 2 lbs. of sugar or 3 cups of corn syrup will be needed for each batch of 25 servings. Amount depends upon sweetness of apples used.

(Recipes on back of page)

Part 7 of Appendix - Page 8 R-6 F.C. Hdbk. Part III - Chapter 4 *Revised 4-20-51 No. 63

HAM SUCCOTASH

Salt

Pepper

25 Servings 50 Servings 100 Servings 150 Servings (Yield -15 Cs. to 8 1bs. 16 lbs. 32 lbs. 48 1bs. Ham (tenderized) person) 1 #10 can 2 #10 cans 4 #10 cans 6 #10 cans Canned Corn Lima Beans, dry 3 lbs. 6 lbs. 12 lbs. 18 lbs. 1 T. 3 T. 6 T. 9 T. 1 t.

1 t.

13 t.

- Soak beans overnite. Boil until tender and drain. (or soak beans and cook in pressure cooker for 15 minutes at 15 lbs. pressure).
- Boil ham (or use left over ham).

· t.

- 3. Heat corn in separate container.
- 4. Combine and keep hot over boiling water. Avoid soupy appearance. enough liquid to keep from being dry.

APPLE SAUCE

- 1. Peel apples. Add small amount of water until soft.
- 2. Mash with potato masher.
- 3. Sweeten to taste 1 lb. sugar per 10 lbs. apples approx.
- 4. Add 1 t. salt per 10 lbs. apples. Use nutmeg if desired.

DEHYDRATED APPLE SAUCE

Follow directions on package.

COFFEE - 50 Cups

- 2-1/2 gals. fresh boiling water.
- 2. Add 1 lb. coffee in cloth bag (may be soaked in cold water to cover).
- 3. Bring to boiling point let stand at this temperature about 10 minutes.

All measurements are level

T - tablespoon

t - teaspoon

C - cup

Part 7 of Appendix - Page 9 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No: 63 lo new instructions

Dinner or Supper

Time Required to Prepare - (not determined)

Menu	: Market :		-	: 100 Servings		: Remarks
Pot roast of beef	Chuck roast of beef Onions Bay Leaf			60 lbs.		(Optional)
Brown Gravy	Salt Pepper Flour Lard	1 pkg. 1 pkg. 1 lb. 2 lbs.	1 pkg. 1 pkg. 2 lbs. 4 lbs.	1 pkg. 1 pkg. 3 lbs. 5 lbs.	1 pkg. 1 pkg. 4 lbs. 8 lbs.	
Potatoes	Potatoes steamed*	20 lbs.	40 lbs.	80 lbs.	120 lbs.	
Green Beans	Green Beans Bacon Tom.Ketchup	1#10 can ½ lb. 1 pt.	2#10 cns 1 1b. 1 qt.	4#10 cns 2 lbs. 2 qts.	6#10 cns 3 lbs. 3 qts.	Use tomato soup if desired.
Relishes	Celery Radishes Onions	2 bun. 6 bun. 2 doz.	4 bun. 10 bun. 4 doz.	8 bun. 15 bun. 8 doz.	12 bun. 25 bun. 12 doz.	Large bunches; to be cut in finger- length strips.
Cabbage Slaw	Cabbage Salad dress. Salt	5 lbs. 1 qt. 1 oz.	10 lbs. 2 qts. 2 ozs.	20 lbs. 4 qts. 4 ozs.	30 lbs. 6 qts. 6 ozs.	3 oz. or 3/4 C. per serving
Plums or berries	Plums	2#10 cns	4#10 cns	8#10 cns	12#10 cn	s 1 C. serving
Cookies	Cookies	4 doz.	8 doz.	16 doz.	24 doz.	
Coffee	Coffee	2 lbs.	4 lbs.	8 lbs.	12 lbs.	50 C 1 lb.
Milk	Milk	3 cans	6 cans	10 cans	16 cans	
Bread	Bread	4 lvs.	8 lvs.	16 lvs.	24 lvs.	4 sls. person; $l^{\frac{1}{2}}$ lb. loaves;
Butter	Butter	2 lbs.	3 1bs.	6 lbs.	9 1bs.	24 sls. loaf.
Jam	Jam	2 lbs.	4 1bs.	8 lbs.	3 lbs.	
*Sugar	Sugar	8 oz.	1 1b.	2 1bs.	3 lbs.	

** - Note: Potatoes may be peeled and cooked with pot roast if desired. Add

(Recipes on back of page)

Part 7 of Appendix - Page 10 R-6 F.C. Hdbk. Part III - Chapter 4 *Revised 4-20-51 No. 63

POT ROAST

- 1. Brown beef in small amount of hot fat. Season with salt, pepper and bay leaf. (Bay leaf optional)
- 2. Add small amount hot water. (Enough to keep from sticking and scorching).
- 3. Simmer (cook slowly) in closely covered kettle or pressure cooker 45 minutes at 15 lbs. pressure for amount for 25.
- 4. Onions, or potatoes may be added about one hour before serving.

BROWN GRAVY

- 1. Add enough liquid (milk or water) to make desired amount of gravy.
- 2. Make thickening. Use \(\frac{1}{2} \) C. flour to 1 qt. broth. (NOTE: Mix flour with small amount of cold water beat until smooth medium thin paste.)
- 3. Add thickening to broth, stir continuously.
- 4. Add seasonings (salt, pepper) to taste. Cook until desired thickness and until done.

GREEN BEANS

	25 Servings	50 Servings	100 Servings	150 Servings
Green beans Bacon Ketchup Salt	1 #10 can ½ 1b. 1 pt. 1 T.	2 #10 cans 1 lb. 1 #2½ 2 T.	3 #10 cans 2 lbs. 2 #2½ 4 C.	5 #10 cans 3 lbs. 3 #2½ 6 T.

- 1. Open cans green beans place in kettle to heat.
- 2. Cut bacon in small 1/2-inch pieces. Brown in skillet. Add to beans. May or may not need all of the fat. Use as seasoning.
- 3. Add ketchup and salt to taste.

COFFEE - 50 Cups

- 1. $2\frac{1}{2}$ gal. fresh boiling water.
- 2. Add 1 lb. coffee in cloth bag (may be soaked in cold water to cover).
- 3. Bring to boiling point let stand at this temperature about 10 minutes. Do not boil.

All measurements are level

T - tablespoon

t - teaspoon

C - cup

Part 7 of Appendix - Page 11 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No new instructions No. 63

Dinner or Supper

Time Required to Prepare - 1 hour

Menu	: Market : : List :	25 Servings	: 50 :Servings	: 100 :Servings	: 150 :Servings	: Remarks
Frankfurters	Frankfurters	13 lbs.	25 lbs.	50 lbs.	75 lbs.	8 per pound 4 per person;
Sauerkraut Steamed Pota- toes	Sauerkraut Potatoes		$\frac{1}{2}$ 3#10 cns 30 lbs.		9#10 cns 90 lbs.	3/4 C. per person
Tomatoes Raw sliced Canned, cold	Tomatoes					2 med.per servg 1 C.per servg.
Canned fruit	Fruit	2#10 cns	3#10 cns	5#10 cns	8#10 cns	
Bread	Bread	5 loaves	10 lvs.	20 lvs.	30 lvs.	5 sl.per person; $l^{\frac{1}{2}}$ lb.lcaf 24 sls.per lf.
Butter	Butter	2 lbs.	4 lbs.	8 lbs.	12 lbs.	with practical
Coffee or Milk to drink	Coffee Milk, canned or fresh	1 lb. 2 tall 4 qts.	2 lbs. 4 tall 7 qts.	4 lbs. 7 tall 13 qts.	8 lbs. 11 tall 20 qts.	50 C1 lb. ½ C. each
Milk	Milk	2 cans	4 cans	8 cans	12 cans	
Sugar	Sugar	8 oz.	1 lb.	2 lbs.	3 lbs.	

(Recipes on back of page)

Part 7 of Appendix - Page 12 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No. 63 No new instructions

FRANKFURTERS & SAUERKRAUT

Open canned sauerkraut. Place in container set in another container of hot water (support in double boiler fashion, coffee can lids, etc.). Cut frankfurters in desired lengths. Mix with sauerkraut and heat thoroughly.

OR (Cook separately as follows)

FRANKFURTERS

Place frankfurters in kettle of boiling water just long enough to become hot. Serve immediately.

SAUERKRAUT

Place cans in boiling water - let boil for 20 to 30 minutes until contents become hot. Open and serve.

STEAMED POTATOES

- 1. Place wooden steaming board in bottom of large container (large enough to hold desired number of potatoes). Steaming board is wooden rack made by boring holes in board and supporting by attaching two small pieces to under side. Size depends upon container.
- 2. Add enough water to come to top of steaming board.
- 3. Place wire rack or basket on top of steaming board.
- 4. Fill with desired number of potatoes. Cover with closely fitting lid. Steam until done (about 1 hour).

Note: Temporary rack for small container may be made by using coffee can lids with holes punched in them.

COFFEE - 50 Cups

1. $2\frac{1}{2}$ gal. fresh boiling water.

2. Add 1 lb. coffee in cloth bag (may be soaked in cold water to cover).

3. Bring to boiling point - let stand at this temperature about 10 minutes.
Do not boil.

All measurements are level

T - tablespoon

t - teaspoon

C - cup

Part 7 of Appendix - Page 13 R-6 F.C. Hdbk Part III - Chapter 4 Page Rewritten 4-20-51 No. 63 No new instructions

Time Required to Prepare l hour (if sandwich meat

	- 4 - GOE		The Ber		cooked)	
	: Market	: 25	, , , ,	: 100	: 150	•
Menu	List	:Servings	:Servings	Servings	:Servings	: Remarks
Veg. Milk Chowder	Potatoes	$2\frac{1}{2}$ lbs.	5 lbs.	10 lbs.	15 lbs.	Servings about 1 cup per person
	Onions	1 1b.	2 lbs.	4 lbs.	6 lbs.	6 med. to a 1b.
	Celery Carrots	6 stalks	12 stalks	24 stalks	36 stalks	
	Fresh or Canned	2 lbs. 1 #2	4 lbs. 2 #2	8 lbs. 1 #10	12 lbs.	
	Canned Cor		3 #2	12 #2	15 #2	(or 2 #10&2#2)
	Bacon	1 lb.	1 lb.	2 lbs.	3 lbs.	or same amt. of
	Milk	4 qts.	8 qts.	12 qts.	16 qts.	dried beef &
	Flour	1 lb.	1 1b.	2 lbs.	3 lbs.	twice amt. of ham
	Salt	l box	1 box	1 box	1 box	or butter
	Pepper	1 box	1 box	1 box	1 box	or preget
Cheese	repper	I DUA	I DOX	I OOX	T DOY	
Sandwiches	Cheese	1½ 1bs.	3 1bs.	6 lbs.	9 lbs.	American Cheese
DationTolles	Cream or	½ pt.	1 pt.	1 qt.	la qts.	WHELTCOM OHEERA
	Canned Mil				6 cans	
	Salt	K I Call	2 cans	4 cans	o cans	To taste
	Cayenne	7/0 72	3 72	1 72	6/1 22	(Optional)
	Butter	1/8 lb.	1 lb.	½ 1b.	3/4 lb.	-1" - 0:
	Bread	2 lvs.	4 lvs.	8 lvs.	12 lvs.	1½# lvs24
	27	0.31	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	6.71	70 71	sls. per loaf
leat	Meat	2 1bs.	4 lbs.	8 lbs.	12 lbs.	Must be this
andwiches						weight after
						boiled or baked
	_					& boned. Grind
	Eggs	2 eggs	4 eggs	8 eggs	10 eggs	May omit eggs,
						but increase
						meat accordingly
	Celery	2 stalks	4 stalks	8 stalks	12 stalks	(Subst.lettuce)
	Pickles	点 1b。	불 1b.	1.1b.	la lbs.	(If available)
	Vinegar	d cup	1 lb. 2 cup	½ pint	3/4 pint	
	Salad Dres	. lpt.	1 qt.	2 qts.	3 qts.	
	Salt		- 6 - 6 - 7			Use to taste
	Bread	2 lvs.	4 lvs.	8 lvs.	12 lvs.	1½# lvs. 24
						slices per loaf
						May use hard-cod
						ed eggs instead
Comato j.						of meat if desir
or grape-	Tomato	2 #10	4 #10	8 #10	12 #10	1 cup per serve.
fruit j. or		~ //	4 11 10	0 11 20	1 1/10	T out bot por A8.
offee	Coffee	2 1bs.	4 lbs.	8 lbs.	12 lbs.	50 C new 1h
filk	Milk	3 cans	,	10 cans	16 cans	50 Coper 1b.
dugar		2 lbs.	4 lbs.	8 lbs.	The second secon	
agar.	Sugar	~ TOSº	4 1050	O TOR	10 lbs.	

Part 7 of Appendix - Page 14 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No new instructions No. 63

Vegetable Milk Chowder

	25 Servings	50 Servings	100 :Servings	
Potatoes Onions Celery Fresh carrots or canned Corn Butter, Bacon,	2 lbs. 1 #2	5 lbs. 2 lbs. 12stalks λ lbs. 2 #2 3 #2	4 lbs. 24stalks 8 lbs. 4 #2	36stalks 12 lbs. 6 #2
Salt Pork or Dried Beef	1 lb.	1 lb.	2 lbs.	3 lbs.
Milk	l gal.	2 gal.	4 gal.	6 gal.
Flour	l cup	2 cups	3 cups	6 cups
Salt	$1\frac{1}{2}$ T.	2 to 3 T	4 to 6 T	6 to 8 T.
Pepper	½ t.	1 t.	2 t.	3 t.
Fat (Use bacon fat or	l cup butter)	2 cups	4 cups	6 cups

1. Prepare potatoes, onions, celery, carrots. (Dice)

2. Cook vegetables - add canned corn.

3. Dice and fry bacon - save fat for white sauce - add bacon to vegetables.

4. Make thin white sauce. Scald milk, use liquid in which vegetables were cooked in also in kettle. Set in pan of hot water or a double boiler. Melt fat - add flour and seasonings. Add part of scalded milk to flour mixture and combine with remaining milk.

5. Stir until it thickens, add vegetables - Cook 15 minutes over boiling

water.

COFFEE - 50 Cups

1. $2\frac{1}{2}$ gal. fresh boiling water.

2. Add 1 lb. coffee in cloth bag (may be soaked in cold water to cover)

3. Bring to boiling point - let stand at this temperature about 10 minutes.

Part 7 of Appendix - Page 15 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No. 63 No new instructions

FIRE CREW MENU #8 COLD LUNCH

*Menu	: Market : List	: 25 :Servings		: 100 :Servings	: 150 : :Servings: Remarks	
Meat Sandwich	Meat Butter Bread	2 lbs. 1/8 lb. 2 lvs.	4 lbs. 1 lb. 4 lvs.	8 lbs. ½ lb. 8 lvs.	12 lbs. Net weight 3/4 lb. 12 lvs. l2# lvs sls. per lo	
Cheese Sandwich	Cheese Cream or Can Milk Salt	$\frac{1}{2}$ lb. $\frac{1}{2}$ pt. $\frac{1}{2}$ can	3 lbs. 1 pt. 2 cans	6 lbs. l qt. 4 cans	9 lbs. American Ch l\frac{1}{2} qts. crumbled or 6 cans grated.	
	Cayenne Butter Bread	1/8 lb. 2 lvs.	1 lb. 4 lvs.	1 lb. 8 lvs.	To taste 3/4 lb. 12 lvs.	
Jam Sandwich	Jam Bread	2 lbs. 2 lvs.	4 lbs. 4 lvs.	8 lbs. 8 lvs.	12 lbs. 12 lvs.	
Orange or Apple	Oranges	$2\frac{1}{2}$ doz.	$4\frac{1}{2}$ doz.	8½ doz.	12½ doz.	
* * * * *	* * * * * *	* * * * *	* * * * *	* * * *	* * * * * * * * * *	* *
Substitute Sandwich						

Filling

Scrambled Eggs	Eggs	2 doz.	4 doz.	8 doz.	10 doz.	
Sandwich Spread	Meat	1 lb.	2 lbs.	4 lbs.	6 lbs.	Grind after
	Dill Pickles Mayonnaise Salad Dres. (Miracle Whip	½ lb.	1 lb. 1 lb.	2 lbs. 2 lbs.	3 lbs. 3 lbs.	Chop fine Mix thoroughly with above.

^{*} Lunch will consist of 3 sandwiches and an orange or apple. Substitution should be made if meat, cheese or jam is not available.

Part 7 of Appendix - Page 16 R-6 F.C. Hdbk. Part III - Chapter 4
Page Rewritten 4-20-51 No new Instructions No. 63

Breakfast

Time Required to prepare (not determined)

	: Market	: 25	: 50	: 100	: 150	:
Menu	: List	:Servings	:Servings	:Servings	:Servings	: Remarks
	Grapefruit-					
Grapefruit	Canned	2 #10	3 #10	6 #10	8 #10	3/4 C-1 servg.
Bacon & Eggs	Bacon	5 lbs.	10 lbs.	20 lbs.	30 lbs.	3 sls.per person,15 sls. per pound.
	Eggs	6 doz.	12 doz.	24 doz.	36 doz.	3 eggs per person
	Salt	2 lb.bx.	2 lb.bx.	2 lb.bx.	2 lb.bx.	
	Pepper	4 oz.can		4 oz.can		
	Milk	5 cans	9 cans	18 cans	27 cans	May use fresh 1 qt. 25 eggs
Raw Fried Potatoes or Hashed Brown	Potatoes Fat	10 lbs.	20 lbs.	40 lbs.	60 lbs.	Based on 1 C. diced per serving. Use fat from above bacon.
Bread	Bread	4 lvs.	8 lvs.	16 lvs.	24 lvs.	$1\frac{1}{2}$ lb.loaves 24 sl.to loaf 4 sl. person
Butter	Butter	2 lbs.	3 lbs.	5 lbs.	10 lbs.	
Jam	Jam .	2 lbs.	4 lbs.	8 lbs.	12 lbs.	Size & No. of can depends on weight.
Coffee	Coffee	1 lb.	2 lbs.	4 lbs.	6 lbs.	Based on 50 C.
Milk	Milk-Coffee	2 cans	'4 cans	8 cans	12 cans	
Sugar	Sugar	8 oz.	1 1b.	2 lbs.	3 lbs.	

(Recipes on back of page)

Part 7 of Appendix - Page 17 R-6 F.C. Hdbk. Part III - Chapter 4 *Revised 4-20-51 No. 63

Scrambled Eggs	25 Servings	50 Servings	100 Servings	150 Servings
Eggs	6 doz.	12 doz.	24 doz.	36 doz.
Milk	3 qt.	la gal.	3 gal.	$4\frac{1}{2}$ gal.
Salt	2 T.	4 T.	½ C.	3/4 C.
Pepper	12 t.	3 t.	3 T.	4 T.
Bacon Fat	1를 C.	3 C.	6 C.	9 C.

(Yield: 3 eggs per serving)

1. Beat eggs

2. Add milk, salt, pepper

3. Heat fat in large pans or kettle. Heat until it bubbles.

4. Pour in egg mixture. Cook slowly, stirring frequently until eggs are firm but not hard.

Note: To keep scrambled eggs soft and tender, cook over boiling water.

Make double boiler by placing coffee can lids in bottom of larger
pan than the one in which eggs are cooked. Add water to lower pan.

Coffee - 50 Cups

1. $2\frac{1}{2}$ gal. fresh boiling water.

2. Add 1 lb. coffee in cloth bag (may be soaked in cold water to cover).

3. Bring to boiling point - let stand at this temperature about 10 minutes. Do not boil.

All measurements are level

T - tablespoon

t - teaspoon

C - cup

Part 7 of Appendix - Page 18 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No. 63 No new instructions

Breakfast

Time Required to Prepare - 2 hours

Menu	: Market : List	: 25 :Servings	: 50 :Servings	: 100 :Servings	: 150 :Servings	: Remarks
Prunes	Prunes "	1 #10 cn $3\frac{1}{2}$ lbs.	2 #10 cns 6½ lbs.	4#10 cns 12½ lbs.		5-8 prunes per serving 40-60 prunes per 1b.
Sausage, Link	Sausage,Link Fat	10 lbs. 1 lb.	20 lbs. 1 lb.	40 lbs. 1 lb.	60 lbs. 1 lb.	3 per person 8 per lb.
Scrambled Eggs	Eggs Milk	6 doz. 5 cans	12 doz. 9 cans	24 doz. 18 cans	36 doz. 27 cans	May use fresh milk.1 qt25
	Salt Pepper	2-1b.can 4-oz.can	2-lb.can 4-oz.can	2-lb.can 4-oz.can	2-lb.can 4-oz.can	eggs.
Bread	Bread	4 lvs.	8 lvs.	16 lvs.	24 lvs.	4 sl.person; 1½ lb.lvs; 24 sl.per lf.
Butter	Butter	2 lbs.	3 lbs.	6 lbs.	10 lbs.	
Butter, Apple	Butter, Apple	2 lbs.	4 lbs.	8 lbs.	12 lbs.	
Coffee	Coffee	1 lb.	2 lbs.	4 lbs.	6 lbs.	int of a state of
Milk	Milk-Coffee	2 cans	4 cans	8 cans	12 cans	
Sugar	Sugar	8 oz.	1 lb.	2 lbs.	3 lbs.	

(Recipes on back of page)

Part 7 of Appendix - Page 19 R-6 F.C. Hdbk. Part III - Chapter 4 *Revised 4-29-51 No. 63

DRIED PRUNES

Wash prunes the night before planning to use. Cover with hot water. Bring to boil and boil 5 minutes. Cover closely with lid and let stand overnight. If further cooking is necessary to make tender, finish cooking next morning. Add sugar if necessary.

LINK SAUSAGE

Melt fat - fry until brown

SCRAMBLED EGGS

	25 Servings	50 Servings	100 Servings	150 Servings
Eggs	6 doz.	12 doz.	24 doz.	36 doz. 9 qtFresh or dilute ½ C. evaporated 4½ C Use drippings from link sausage.
Milk	4½ C.	2½ qt.	5 qt.	
Salt	2 T.	3 T.	6 T.	
Fat	3/4 C.	1½ C.	3 C.	

- 1. Beat eggs slightly with milk and salt.
- 2. Add egg mixture to melted fat.
- 3. Finish cooking in a fry pan, or in a double boiler. Stir constantly.
- 4. As soon as eggs are thickened, remove from fire. Serve at once.

COFFEE - 50 Cups

1. 2½ gal. fresh boiling water.

2. Add 1 lb. coffee in cloth bag. (May be soaked in cold water to cover).

3. Bring to boiling point - let stand at this temperature about 10 minutes.

Do not boil.

All measurements are level

T - tablespoon

THE THE WELL STORY OF THE STORY

t - teaspoon

C - cup

Part 7 of Appendix - Page 20 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No. 63 No new instructions

Breakfast ,

Time Required to Prepare (not determined)

	: Market	:	25	:	50	:	100		150	:
Menu	List	:Se:	rvings	:Se	rvings	:Sei	rvings	:Se	rvings	: Remarks
Corned beef hash	Corned beef hash	2	cans	4	cans	8	cans	12	cans	6 lbs.per cr
Bacon	Bacon	1	1b.	2	lbs.	4	lbs.	6	lbs.	Dice and fry for fat for eggs
Scrambled Eggs	Eggs Milk	100	doz. cans		doz. cans		doz.		doz.	Increase if desired up to 1 qt.per 25 eggs.
	Salt Pepper		pkg.		pkg.		pkg.		pkg. can	2) 6660 °
Prunes or	Prunes, dried or	4	lbs.	8	lbs.	12	l lbs.	20	lbs.	Dried
Plumes, canned Bread	Plums Bread		#10 cn:				/10 cms		#10 cns	5 4 oz., or 5 plums per serving $1\frac{1}{2}$ lb. lvs. 24 sl.per la 4 sl.per per
Butter	Butter	2	1b.	3	lbs.	5	lbs.	10	lbs.	son.
Jam	Jam '	2	lbs.	4	lbs.	8	lbs.	12	lbs.	
Coffee	Coffee	1	1b.	2	lbs.	4	lbs.	6	lbs.	50 C1 lb.
Milk	Milk	2	cans	4	cans	8	cans	12	cans	
Sugar	Sugar	g	OZ.	1	lb.	2	lbs.	3	lbs.	11-2-1-17
										2 12 42

(Recipes on back of page)

Part 7 of Appendix - Page 21 R-6 F.C. Hdbk. Part III - Chapter 4 *Revised 4-20-51 No. 63

HASH

Place cans (unopened) in kettles of boiling water. Boil for about 30 minutes. Open and serve.

OR

Open cans - slice and fry in bacon fat or lard.

BACON & SCRAMBLED EGGS

	25 Servings	50 Servings	100 Servings	150 Servings (Yield: 3 eggs
				per person)
Bacon	1 1b.	2 lbs.	4 lbs.	6 lbs.
Bacon fat	3/4 C.	1½ C.	3 C.	4½ C.
Eggs	6 doz.	12 doz.	24 doz.	36 doz.
Milk	42 C.	2½ qt.	5 qt.	9 qt. (fresh, or dilute
Salt	15 T.	3 T.	6 T.	½ C. evaporated) may
	general transport			be increased up
				to 1 qt. per 25
				eggs.

- 1. Dice bacon into fine pieces brown in fry pan. Pour off fat in excess of the amount called for in above list.
- 2. Beat eggs slightly with the milk and salt.
- 3. Add egg mixture to the bacon and fat.
- 4. Finish cooking in fry pan; or in double boiler. Stir constantly.
- 5. As soon as eggs are thickened, remove from fire. Serve at once.

DRIED PRUNES

Wash prunes the night before planning to use. Cover with hot water. Bring to boil and boil 5 minutes. Cover closely with lid and let stand overnight. If further cooking is necessary to make tender, finish cooking next morning. Add sugar if necessary.

COFFEE - 50 Cups

- 1. 2½ gal. fresh boiling water.
- 2. Add 1 lb. coffee in cloth bag. (May be soaked in cold water to cover).
- 3. Bring to boiling point let stand at this temperature about 10 min.

All measurements are level

T - tablespoon

t - teaspoon

C - cup

Part 7 of Appendix - Page 22 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No. 63 No new instructions

Breakfast

Time Required to Prepare - (not determined)

Menu	: Market : List	: 25 :Servings	: 50 :Servings	: 100 :Servings	: 150 : Servings: Ren	narks
Grapefruit	Grapefruit (fresh)	2 #10 cn 1½ doz.	$3 \# 10 \text{ cn}$ $4\frac{1}{2} \text{ doz}$.		9 #10 cn 3/40 14 doz.	Servg.
Hot Cakes	Prepared mix Milk Eggs Fat - bacon	8 lbs. 4 cans 10 eggs \frac{1}{2} lb.	16 lbs. 8 cans l½ doz. 1 lb.	32 lbs. 16 cans 3 doz. 2 lbs.	24 cans cake $4\frac{1}{2}$ doz. pers	bacon
	Sugar Salt	1 box	1 lb. 1 box	2 lbs. 1 box	3 lbs. 1 box	
Eggs(fried or soft cooked)	Eggs	5 doz.	8 doz.	16 doz.		2 eggs person
Bacon	Bacon	6 lbs.	12 lbs.	24 lbs.	pers	per son; 15
Syrup	Syrup	5 lbs.	8 lbs.	15 lbs.	20 lbs.	er 1b.
Coffee	Coffee	1 1bs	2 lbs.	4 lbs.	6 lbs. 50 0	per lb
Sugar	Sugar	8 oz.	1 1b.	2 lbs.	3 lbs.*	
Milk	Milk	2 cans	4 cans	8 cans	12 cans	

(Recipes on back of page)

Part 7 of Appendix - Page 23 R-6 F.C. Hdbk. Part III - Chapter 4 *Revised 4-20-51 No. 63

HOT CAKES	25 Servings	50 Servings	100 Servings	150 Servings
Prepared Mix Milk Eggs Fat bacon Sugar	8 lbs. 4 cans 10 1 C. 1 C.	16 lbs. 8 cans 18 2 C. 2 C.	32 lbs. 16 cans 36 4 C. 4 C.	48 lbs. 24 cans 4½ doz. 6 C. 6 C.

May add salt if needed - depends upon brand.

Method

- 1. Measure prepared mix place in large mixing bowl.
- 2. Beat eggs combine with milk and melted fat.
- 3. Add sugar and slight amount of salt (depends on saltiness of bacon fat).
- 4. Add liquid ingredients to dry combine Bake on hot griddle.

All measurements are level

T - tablespoon

t - teaspoon

C - cup

Part 7 of Appendix - Page 24 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No new instructions No. 63

RENTAL OF PRIVATE EQUIPMENT

(Extra sheets for placing in Camp Boss outfits, if desired, can be obtained on requisition).

Passenger Cars and Pickups

May be hired from employees driving their own or other cars, employees with drivers other than themselves, and nonemployees. Hauling rates are as follows (See F.S. Manual, GA-H4-1): *

Vouchers should show number of employees and amount of equipment hauled, mileage, and rate per mile. For an employee-owner, the voucher should carry the following statement:

"Fire emergency; Government or other privately-owned equipment not available."

Tractors and Trucks

Rates shown on following page are not mandatory, but it is urged they not be exceeded. Owners to furnish all necessary repairs due to ordinary wear and tear expected on a fire. Servicing and repair work to be done outside hours for which rental is based. No rental to accrue when equipment cannot be used due to poor condition or breakage. Operators to be placed on Forest Service pay roll at fire fighter wage rates. *

Forest Service to assume responsibility for loss or damage, exclusive of ordinary wear and tear, while equipment is being used, transported, or held on standby, unless such loss or damage is due to negligence of the owner or his employees.

Pack and Saddle Animals

The rates given below should not be exceeded, except in cases where required animals cannot be otherwise rented: *

#Owner to furnish animals in sound condition.

Forest Service to bear cost of repairs to equipment resulting from fire use when such repairs are necessary to continued operation. If necessary for Forest Service to make repairs because equipment was not in first-class condition when received, the cost will be deducted from rental payments.

Part 8 of Appendix - Page 1 R-6 F.C. Hdbk. Part III - Chapter 4 Page Rewritten 4-20-51 No new instructions No. 63

1.	T1 2012	cks
0	TI.M	CKS

	: Schedule A :		0	Schedule B	
Size	:Mileage : Rate	Daily Min.	:	Mileage Rate	D _{aily} Min.
1/2- to 3/4-ton pickup 1½-ton	\$.09	9.00 \$ 15.00		\$.06 .10	\$ 9.00 15.00
3- to 5-ton	. 30	30.00		.22	30.00

Schedule A - Owner to furnish fuel, oil, and grease.
Schedule B - Forest Service to furnish fuel, oil, and grease.

Daily minimum rates are for calendar day of 24 hours. If truck is under rental a fraction of a day, figure minimum rate to nearest one-fourth day.

2. Tractors with Bulldozers

	: Hourly Rates		
Size Class	:Schedule A : Schedule B : Standby		
D4 and similar	\$ 6.60 \$ 6.00 \$ 3.30		
D6 and similar	8.00 7.35 4.00		
D7 and similar	10.80 10.10 5.40		
D8 and similar	11.20 10.45 5.60		

Schedule A - Owner to furnish fuel, oil, and grease.

Schedule B - Forest Service to furnish fuel, oil, and grease.

A & B rates will apply when tractor is working on control line or otherwise operating under its own power; standby rates when the machine is held idle or being transported by truck. Maximum standby 8 hours per day. If tractor is used 8 hours or more in any calendar day, no standby time will be allowed; if used less than 8 hours, maximum standby allowance will be 8 hours less period of use.

- 3. Power Saws Without operator \$2.00 per hour (\$10.00 maximum per day)

Mileage run by the truck will be paid for at rates shown under Item 1.

Part 8 of Appendix - Page 2 R-6 F.C. Hdbk. Part III - Chapter 4 Page Revised 4-3-52 No. 67

WAGE RATES - REGION 6 UNITED STATES FOREST SERVICE

(Additional supply available in R.O.)

Fire Fighting Rates for 1954#

(See instructions following schedule)

Item: No.:	Pay roll Title## (All non-Classified, Exempt from Overtime Act)	:Rates with Board : Per Hour			
	Common Labor Group				
1. 2. 3.	Firefighter (Unskilled) Firefighter (Semi-skilled) Cook's Helper	\$ 1.05 1.40 1.05			
	Supervisory Labor Group				
- 3a. 4. 5. 6.	FF Strawboss FF Crew Boss (Foreman) FF Sector Boss FF Division Boss	1.50- 1.65 1.85 2.20			
Skilled Labor Group					
7.	Faller	2.05			
8.	Tool Sharpener	1.40			
9.	Automotive Mechanic	1.70			
10.	Truck Driver I Truck Driver II	1.45 1.60			
12.	Bulldozer Operator II	2.10			
13. 14.	Packer Packer Helper	1.55 1.40			
15.	FF Pump Operator	1.55			
16.	FF Airplane Cargo Dropper	1.90			
17. 18. 19.	Second Cook Camp Cook III (less than 30 men) Camp Cook IV (over 30 men)	1.50 1.60 1.80			

#Effective June 3, 1954.

##The prefix "FF" will be used with each title on payrolls. Limit to titles shown.

Part 9 of Appendix - Page 1 R-6 F. C. Hdbk. Part III - Chapter 4 *Added 6-11-54 No. 84

INSTRUCTIONS FOR APPLICATION OF FIRE-FIGHTING RATES#

Item number and pay roll title, should be shown on all time slips and pay rolls. Titles must be limited to those itemized. The prefix, "FF", should be placed in front of all titles when used on pay rolls.

Common Labor Group: Only fit, able-bodied men, used to manual labor, preferably to woods work should be employed on the control line. The Item 2 rate should be paid to local cooperators - individuals or in crews - with whom advance arrangements have been made and when approved by the district ranger and to those who can skillfully use sharp-edged tools. The Item 1 rate applies to unknown inexperienced fire fighters used on unskilled jobs. Fire fighters used for incidental falling, but who are not experienced fallers should not be paid faller rates. *-(Item 7).-*

Include in the common labor group, Items 1 or 2, all fire fighters on miscellaneous jobs such as carrying water, using and watching simple communication facilities, posting time, incidental safety care, and carrying messages. Limit to not over 10 hours a day if assigned around camp except in rare emergencies.

Supervisory Labor Group: Those included in Items 4 to 6 assigned to control line work, should only be paid while traveling or on the fire line and not for time spent in fire camps. Those hired to supervise camp laborers in fire camps, should not be paid for over 10 hours per day except in rare emergencies. In the supervision of those engaged in SOS activities, Item 4 should be used for small fire camps of less than 30 men, Item 5 for medium size fire camps of 30 to 100 men, and Item 6 for large fire camps of over 100 men.

Skilled Labor Group: Use various applicable titles shown. Time must be limited to actual hours worked, and 10 hours per day should not be exceeded except in umusual emergencies. *-Apply Item 7, Faller, rate to Power Saw Operators and Hand Fallers.-*

-Subsistence: It is the policy to furnish subsistence on all project fires. When government subsistence is available, no allowance will be made to employees furnishing their own subsistence. When employees furnish their own subsistence on small fires because government subsistence is not available, the applicable wage rate should be increased 25 cents per hour, and "Selfsubsisted" entered on the timeslip. UNDER NO CIRCUMSTANCES WILL ALLOWANCE BE MADE FOR BOARD WHERE GOVERNMENT SUBSISTENCE IS AVAILABLE.-

**-Travel Time: Allowance for travel time will be in strict accordance with "Specific Rules," Form 106-R6, Fire Fighters Contract. These provide for travel time allowance from point of hire and return.

It is expected that camps will be established on all project fires. Daily travel between camp and place of residence should be discouraged. Employees who do so at their personal convenience will not be allowed time for such travel. Travel time from point of hire to camp and return will be allowed only for the initial day of arrival and the day of release.—***

Part 9 of Appendix - Page 2 R-6 F. C. Hdbk. Part III - Chapter 4 *Amended 6-1-53 **Added 6-1-53 No. 74

#For complete details refer to the GA Manual, Chapter E, Part 15.

FIRE CONTROL HANDBOOK REGION 6



PART III SUPPRESSION

CHAPTER 5
DROPPING SUPPLIES FROM
AIRPLANES

Air Operations Handbook

REGION 6

PARTITI

SUPPRESSION

CHAPTER VII

DROPPING SUPPLIES FROM AIRPLANES

PART 131 - SUPPRESSION - CHAPTER VIII

DROPPING SUPPLIES FROM AIRPLANES

Table of Contents	
Pag Pag	e No.
Introduction	-5-1
Organization	-5-2
Packer Foreman	-5-2 -5-2 -5-2 -5-2 -5-4 -5-4
Specific Instructions	-5-4
Packaging	-5-4 -5-5 -5-15 -5-15 -5-19 -5-19 -5-21 -5-26 -5-28 -5-30 -5-31 -5-33 -5-33
Retrieving Bundles III	-5-34 -5-34 -5-34
General Safety Rules for Dropping Supplies III	-5-34
Precautions in Locating Landing Target III	-5-35 -5-36 -5-36

DROPPING SUPPLIES FROM AIRPLANES

Introduction

It should be recognized that the method of aerial delivery has its limitations and that it cannot be depended on to function at all times without fail.

When heavy smoke or fog is present, flying is too hazardous and supplies cannot be delivered by air. Consequently, when such conditions are anticipated and when it is practicable to do so, camps should be provided at least with concentrated supplies in excess of immediate needs in order to tide them over such periods of interrupted service.

In selecting a method of transporting supplies and equipment to fires, three elements must be considered: time, cost, and practicability.

- l. Time is very important in fire suppression and every practicable method which contributes to a reduction in the time required to suppress a fire is usually reflected in lower ultimate cost and damage. Any advantage gained by reducing the delivery time of cargo should be carefully considered before choosing airplanes instead of slower methods of transportation.
- 2. When packing over trails in excess of 15 miles is necessary and an airplane base is available at not too great a distance, the cost by either pack train or airplane may be about equal. An increase in trail mileage over 15 miles may give the airplane the advantage in cost but condition of trails, availability and prices of pack stock, air distance from the landing field to the fire, road mileages and conditions, and condition of the landing field as well as its proximity to a supply base should all be considered.
- 3. In extremely rugged country where there are no trails, packing by stock is impossible and by man is very slow and laborious. In such instances airplanes have the advantage. On the other hand, smoke, fog, or other bad flying conditions may exist to the extent that airplanes cannot be used.

It is also felt that the dropping of cooked foods to crews on the control line will become more and more common with the development of aircraft, landing fields, and delivery methods. By setting up a field kitchen at the airport, hot foods can be served to the crews on the fire without the expense and effort of transporting cooking equipment, crating, and wasted food parts, such as potato peelings, eggshells, etc., to the fire. Foods such as cooked steaks or roasts, hot potatoes, gravy, bread, butter, coffee, and stewed fruit, as well as paper plates, cups, and spoons can be dropped without difficulty. One man in the fire crew can be assigned as a flunky to dish up the meal when it is delivered. With inexpensive containers there is nothing to pack out except the chutes. It is important, however, that the precaution be taken to provide crews with a few concentrated rations in case the airplanes are grounded by poor flying conditions.

JII-5-1

Organization

On large fires a complete organization at the base may consist of a dispatcher, packer foreman, packers, chute men, checker, and drivers. The plane crew consists of the pilot and dropper. A pickup crew is often desirable at the dropping location. Only such of these men should be used as are essential for the project. Usually duties are combined.

Dispatcher

The dispatcher is in general charge of the dropping organization and should correlate his work closely with the SOS boss on the fire. He should review the orders from the camps, check on the packing in general, see that flight and load records are properly kept and dispatch the airplanes. It is essential that the dispatcher have good communication with the fire camps.

Packer Foreman

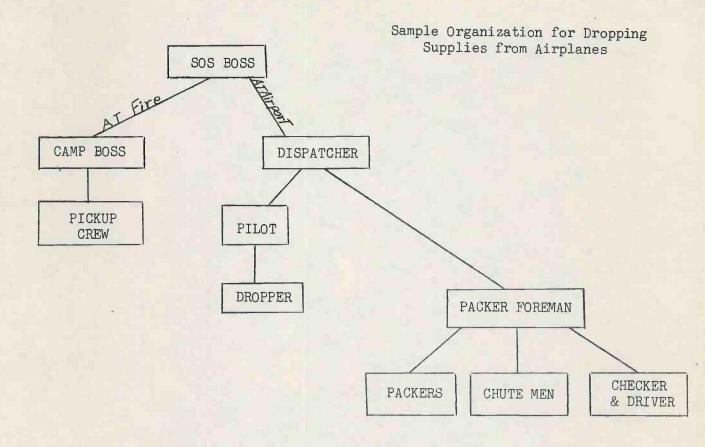
The packer foreman is in immediate charge of the chute preparation and supply packaging. He should check to see that each chute is properly folded, rolled, and attached to the cargo. He should supervise and assist with the packing and make sure that the load tags and records are properly billed out and attached to the loads. He should arrange to have the cargo at the landing field by the time the plane is ready to load.

Packers, Chute Men, Checker, and Drivers

These men receive their instructions from the packer foreman and work under his direct supervision.

Pilot

The pilot is in charge of the plane at all times. He will determine the maximum safe loads under prevailing take-off and flying conditions. He may be called upon to render service at all hours between daylight and dark if flying conditions permit. The pilot will receive his flight instructions from the dispatcher.



Figure]

Dropper

The dropper should be a man who has been instructed in packing and discharging bundles. He should not be one that is easily affected by "air sickness." If the dropper is furnished by the airplane operator, he is under the supervision of the pilot at all times. If he is a Forest Service employee, he will be given instructions by the dispatcher but also must closely correlate his work with the pilot, especially while in flight.

Pickup Crew

The pickup crew may consist of one or more men at the dropping location who retrieve and check each bundle. They should work under the supervision of the camp boss or where one dropping location serves several camps, they should receive orders from the nearest camp boss.

Specific Instructions

Dispatcher Duties

- 1. Analyze requisitions as they are received from the field and arrange to forward the most urgently needed supplies first.
- 2. Check on the items to be dropped and turn down those unsuitable for dropping. It is desirable not to depart too much from the standard ration table No. 2 (to be used when packing over 5 miles) in the Service of Supply chapter of the Fire Control Handbook, except when cooked supplies are to be dropped. Requisitions for supplies such as cantaloupes, fresh tomatoes, supplies packed in glass jars, and similar unsuitable articles should not be accepted.
 - 3. Inspect in general the packing operations.
- 4. Schedule and dispatch the airplanes. It is better if the dispatcher can give his instructions regarding time of leaving and destination directly to the pilot to avoid misunderstanding and errors. Any planes overdue should be checked on immediately.
- 5. Maintain adequate communication with the fire camps or crews being served. This is necessary in order that:
 - (a) The dispatcher can inform the camps of any shortages or changes in their requisitions and what time the supplies may be expected.
 - (b) The camp boss can inform the dispatcher of emergency orders, loss of any necessary bundles, and information that may assist the dropping crew to perfect their work.
 - 6. Check to see that flight and load records are being properly kept.

7. Provide assistance to the pilot for servicing the airplane and arrange for delivery of gasoline, oil, etc. to the airplane base.

Packaging

As far as possible the cargo dropped should be packaged in the shipping cases or cartons. Miscellaneous articles should be packed in boxes, cartons, or sacks. The following instructions cover the packaging of the most common items. Suggestions for dropping similar items may also be obtained from this information.

- 1. Avoid tall packs.
- 2. When using boxes for miscellaneous articles, put heavier items in bottom, lighter items and those more susceptible to damage on top. Flat or broad boxes are preferable to deep boxes.
- 3. Tie sacked materials so sacks land flat on side (grain, potatoes, rice, etc.). Sacks should not be filled too full.
- 4. Make pads of bags filled snugly with sliced white bread, paper excelsior, or hay. By using burlap sacks partly filled with padding material, the cargo can sometimes be placed in the sack on top of the padding without further roping of the bundle.
- 5. Tie pads to loads both ways so pad ends do not hang down, leaving ends of load unprotected in windy landings.
- 6. One-quarter inch manila rope has been found to be more satisfactory than 3/8" rope in tying the bundles, except for the 25-man mess outfits or two-chute packages which should be tied with 1/2" manila or three wraps of 1/4" rope. Pass all four chute lines under as many ropes as possible, and suspend exactly over the middle of bundle. Insufficient tying has caused most losses, due to the severe straining on all connections when the chute opens with a violent snap.
- 7. In some cases, such as with mess outfits, radios, lanterns, etc., the use of landing boards is imperative. (See Figure 2.) Various thicknesses of landing boards are recommended. Twenty-five man mess kits and other such heavy loads should have 1/2" plywood landing boards and the lighter loads 3/8" plywood.

Cost of the landing boards and the extra work necessary for using them does not warrant their use for cargo dropping except in special cases as mentioned above. Where boards are used on packages they should be just slightly larger than the package. If the boards have too much oversize there is danger of fouling on the plane.

8. Cans, etc. The following items are all packed on the same general principle of placing container on a board, notched or bored for holding the

rope. (See Figures 3, 4, and 5.) Put a board inside the flange of full milk cans. Empty milk cans need no board.

	<u>Item</u>	Proper Loads	
b. c. d.	5-gallon milk cans 1 10-gallon milk cans 1 10-gallon milk cans 1	to 4 empty or 1 full to 4 empty or 1 full to 2 empty full full	1 chute (7x7) 1 " 2 " 1 "
	Sliding-spout steel can (For water, oil, gas, etc.)		
f.	Back-pack cans 1	to 3 empty only	1 "
	(Also in sacks with some hay.)		
g.	Kerosene or gas lanterns 1	to 4 (pad under)	1 "
	(Also in sacks or in cartons.)		
h.	25 man mess kit on 1/2" board (See Figure 6.)	, tie with 1/2" rope	2-3 chutes
unopened	Canned goods. All canned goo shipping case. Usually board as flat as possible. (See Fig	s or padding are unnecessary	
10.	Sacked items. The following	items may be placed in a gra	in sack:
a.	6 man and 10 man mess kits		1 chute
	(Place some padding in bottom of sack directly to chute.)	of sack and tie top	
b.	Meat - maximum 60 lbs. flat		1 chute
c.	Potatoes - 1 sack full (vary	much in susceptibility)	1-2 chutes
d.	Fresh vegetables - 1 sack ful	l, flat	1 chute
e.	Oranges, 1 sack full - 63 lbs (See Figure 12)	., flat (best in crate)	1-2 chutes
f.	Emergency rations, 1 doz., fl	at	1 chute
g.	Grain - without loose overcoatie loosely to end.	t, 50 lbs. No board,	1 "

R-6 F. C. Hdbk.
Page added 5-23-41
No. 2

	h.	Grain - in loosely-tied overcoat sack or canvas, 100 lbs. No board - flat. (See Figure 12)	No	one or 1 chute
	i.	Dried fruits, rice, sugar, beans, rolled oats, etc. in sack lots inside loosely-tied overcoat sack. No board - flat.	No	one or 1 chute
	j.	Bread, sliced, white, 1 to 4 sacks, rope around middle of sacks one way only. (See Figure 13)	1	chute
	k.	4 kerosene or gasoline lanterns in grain sack. (In cartons if possible.)	1	u
flat bo	oxes.	Boxed items. Place the following items in boxes, prefer Put heavier items on bottom. Use pads on more fragile 7.)		
	a.	Headlights, canteens, timekeeper outfits, cobbler outfits, waterbags, grinders, saw filing outfits, batteries, files and rasps.	1	chute
		(Pack in box of approximately 60 lbs. weight)		
	b.	Sliced bread in large cartons but not over 2 feet square.	1	u
	c.	Emergency rations up to 12.	1	п
	d.	Dry foods up to 70 lbs. Place in individual muslin bags where items are wrapped in light wrappers such as cellophane.	1	"
	e.	Telephone	1	ıı
	f.	Telephone tools	l per	" 60 lbs.
	g.	First aid outfits		" 50 lbs.
	h.	Butter in 1-lb. paper cartons up to 25 lbs. (Keep cool until sent out.) Butter best delivered in tins same as canned goods.	1	ıı
	i.	Horseshoeing outfits	l per	60 lbs.
	j.	3 back-pack cans	1	
	k.	1 crate of oranges - 80 lbs. (See Figure 12)	2	chutes
R-6 F.	C. H	Idbk. III-5-7		

(Bolt down with strips over flanges to 2" board)

- m. Eggs may be broken and dropped in milk can or 12 "
 whole eggs may be dropped in crate, packed with
 long type, 1 doz. cartons in lots of 10 doz.
 (See Figure 12)
- 12. Handled tools. (See Figures 8, 9, and 10) Axes, hoes, Pulaskis, brush hooks, Kortich tools, etc. Heads should be boxed or wrapped in burlap. Packages of approximately 60 lbs. (about 12 axes) make the most convenient package size.
- 13. Saws, falling. (See Figure 11) 1 to 6 saws nailed, wired, or bolted to 1/2" board, 1" wider than saws when in place. Use hose guards or building paper between saws to protect teeth and rakers. Suspend in bridle so saws will land horizontally. Fasten handles to saws or place in burlap sack and tie to board.
- 14. Shovels. Six to a bundle is a convenient size. Wrap blades in burlap and suspend in bridle so shovels will land horizontally. I chute
- 15. Matches. Use safety matches placed on top of other loads or place in bag with loose overcoat bag and drop without chute.
 - 16. Radios.
 - a. Drop the smaller radios using 1 chute and a pad under radio.
 - b. Drop the heavier sets with 3 chutes. Tie a pad under radio box.
- 17. Miscellaneous. The following articles may be dropped without a chute:
 - a. Bale of hay in wool sack.
 - b. I sack of grain, sugar, flour, rice, beans, dried fruit, etc. in loosely-tied overcoat sack.
 - c. 2 beds in suitable sack.
 - d. Tentage in suitable sack.
 - e. 80-lb. roll #9 telephone wire.
 - f. 50-ft. roll $1\frac{1}{2}$ " hose.

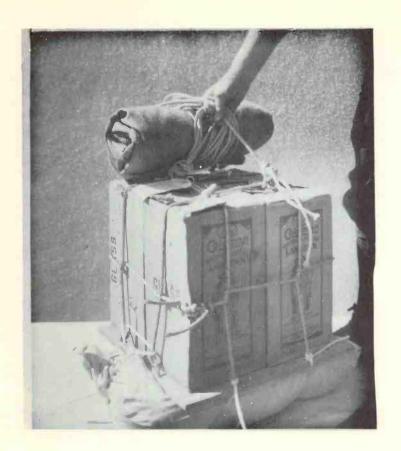


Figure 2

4 lanterns in cartons with plywood board and padding. Use 1 chute.



Figure 3
4 empty milk cans (no board)
1 chute.

R-6 F. C. Hdbk.
Page added 5-23-41
No. 2



Figure 4
10-man mess kit on board. May also pack in excelsior in bottom. 1 chute.

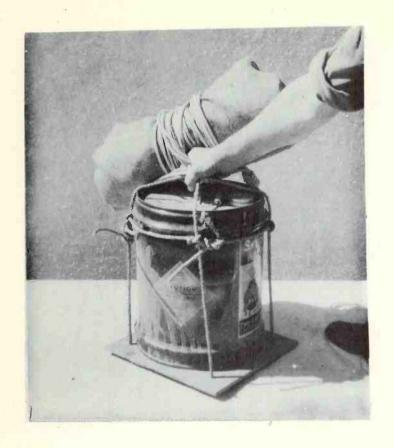


Figure 5

Method of roping plywood boards to metal containers.

Protects corners of containers to be used for liquids. Square corners of board should be cut off as shown in Figure 6.



Figure 6

25-man mess kit on $\frac{1}{2}$ " plywood board. Use 4 chutes. Tie very securely.

R-6 F. C. Hdbk.
Page added 5-23-41
No. 2

III-5-10

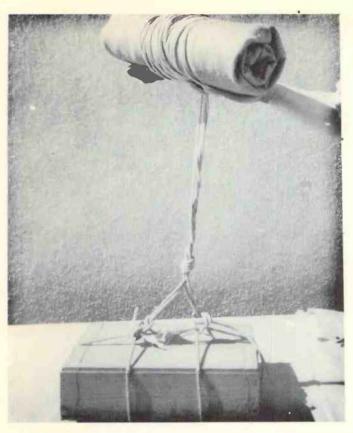


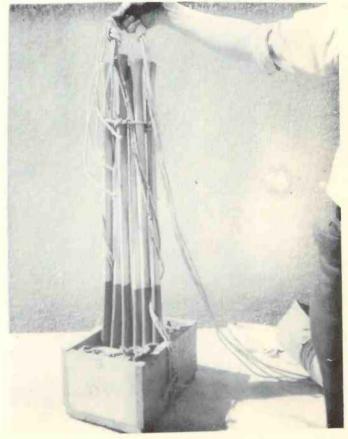
Figure 7

Battery box. 1 chute.
All cargo should be attached to land on the largest surface.

Boxes and other suitable containers should be used whenever possible.

Figure 8

Handled tools packaged in boxes as shown, or with heads wrapped in burlap. 1 chute.



R-6 F. C. Hdbk. Page added 5-23-41 No. 2

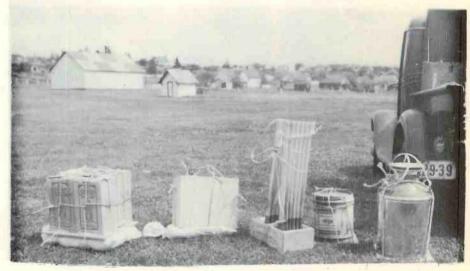


Figure 9

The loop shown should be half-hitched (twice) around the handles to eliminate the separate rope tied around the handles. Use 1 chute.

Figure 10

Assemblage of cargo packaged for dropping. See comments under each item.



4 Coleman or 4 kerosene lanterns (1 chute).

1 M.10 Edwards gas pump (2 chutes).

12 D.B. axes (1 chute) can (1

5-gal. steel

chute).

10-gal milk can (1 chute).

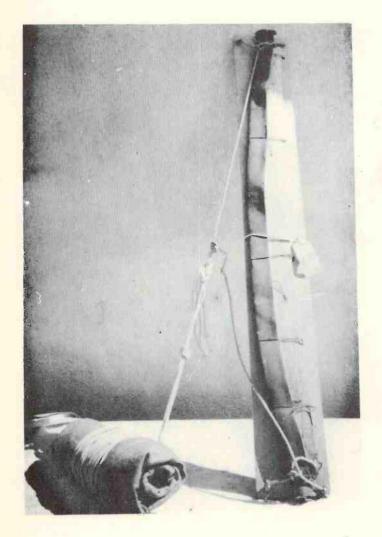


Figure 11

Method of attaching 1-6 saws to one chute.

Board on back, saws fastened to board, guard over teeth.

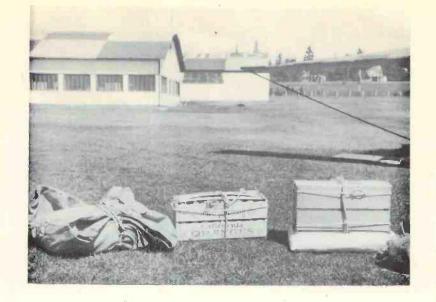


Figure 12

Sack of grain in canvas fly. (No chute.)

Crate of oranges (2 chutes).

Crate of eggs (2 chutes.)
Sack of straw for pad.

Assemblage of cargo packaged for dropping. Better to divide grain into loosely filled sack and use chute unless canvas is needed at fire camp.



Figure 13

1-4 sacks of white sliced bread.

25-man mess kit on $\frac{1}{2}$ " board (4 chutes).

1 sack of potatoes on board (2 chutes).

5-gal. steel cans.

III-5-14

Preparing Chutes

Material: Considering costs, it has been determined that 10 oz. burlap is the most satisfactory material for cargo parachutes. The best canopy size is controversial, but considering the 7'x7' and 10'x10' sizes, there is 100% increase in area with the 10'x10' size, with only 50% increase in cost, and only a slight increase in bulk.

Chute lines should be of 3/16" or 1/4" "Cloverleaf" manila rope, 15 feet long. Four lines are needed for each chute.

Folding and Rolling: The manner in which a parachute is folded determines the speed with which it opens. Quick opening causes excessive shock and stress, due to the forward speed of the plane, the blast of the propeller, and the angle at which the parachute strings out and opens. The ideal point to have the chute open is usually at that point where the forward speed caused by the plane is reduced to a speed equal to that gained by the force of gravity. When the load is light it is best to have the chute open quickly so that the slip stream or propeller blast aids the opening. In this case the light load does not cause any excessive strain in opening.

In all cases the weight of the cargo must be heavy enough to fall faster than the rolled chute.

The chutes are folded and rolled according to the following instructions and sketches:

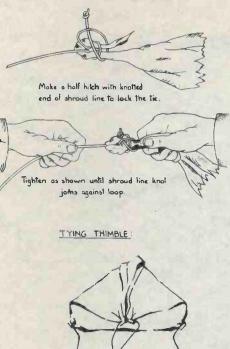


Figure 14

The lines are tied to the chute corners by a tight square knot, the chute being considered as another line. Then lay the chute flat on the ground with lines clear. Be sure the knots are tight. Careful inspection of these connections should be made each time the chute is used. The ropes at the chute corners should be checked before rolling and also before discharging, if possible. This is important, as a loose rope may be the cause of a corner ripping out or coming off the chute entirely.

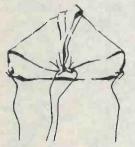


Figure 15

Two of the corners are brought together.

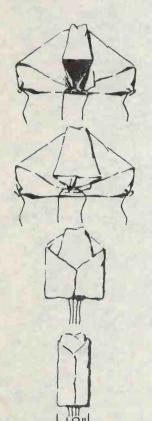


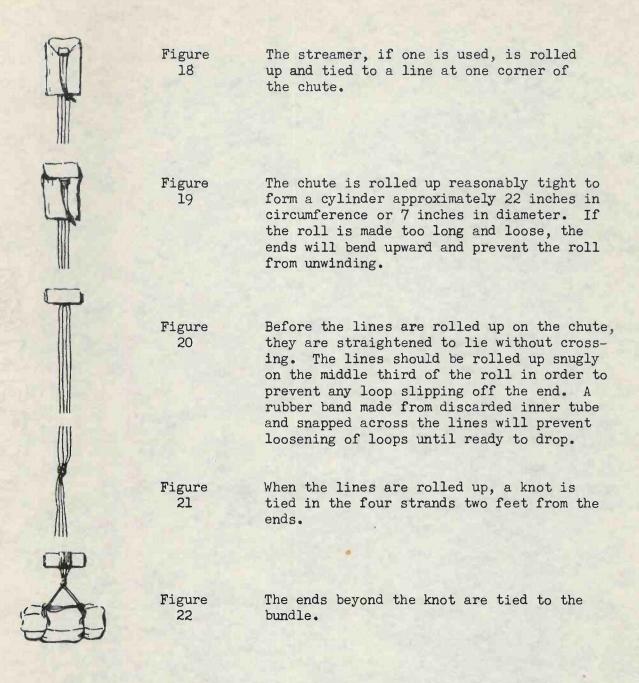
Figure 16

The folds are straightened and formed into a pocket to facilitate the opening of the chute.

Figure 17

The two sides are folded to the center and then folded again to the center to a width of 18 inches. If roll is less than 18" long, the chute will be too stubby, will fall too fast, and may not open.

R-6 F. C. Hdbk. Page added 5-23-41 No. 2



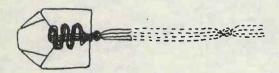
If the chute is flattened by the weight of other loads in the plane, it should be shaped before discharging.

When the bundle is discharged from the plane, a few feet of slack should be left between the load and chute if the load is bulky.

When the chutes have been stored for some time or stored where they have drawn moisture, each chute must be unrolled, checked, and rerolled. The compression caused by storage or dampness will often cause the chute to fail.

With lightweight loads (10 to 20 lbs.) the following method of rolling the chute should be used. This method should not be used with heavier loads because the chute opens instantly and the opening shock is excessive with heavy loads.

Follow steps 1, 2, 3, and the first part of step 4 of the instructions on the preceding pages. The lines are then straightened out to lie parallel without crossing. A knot is tied with the four strands two feet from the ends. The next step is to draw the lines up and accordion them as shown in the diagram:



(The dotted line shows position of lines before this step was made.)

Figure 23

The burlap is then folded over the accordioned lines as shown in the last part of step 4. Care must be taken that no loose fold of the burlap gets inside a loop of the shroud lines. Roll from the top. The chute must be rolled tightly or the lines will entangle the canopy and it will not spread open.

The rubber band (inner tube) is then placed around the rolled chute and over the knot (this must be done to prevent the accordioned lines from being pulled out in handling).

The ends of the lines must be tied tightly to the tie line of the cargo.

This type of roll will open immediately so it must be thrown downward when dropping or the propeller blast will blow the chute into the tail assembly of the plane. To discharge, hold the cargo on the palm of one hand with the rolled parachute on top. Place the other hand on top of the chute and throw downward out the door. Be careful so that no part of the clothing or hands gets caught on any part of the chute, cargo, or ropes.

Fastening the Chute to the Bundle: The single largest source of loss in dropping supplies is caused by improper tying of bundles to the chute lines.

Parachutes usually open in the air with a violent snap which strains all connections. It is for this time of exceptional strain that chute lines and ties around bundles must be prepared. The strength of the bundle ties should be equal to the combined strength of the four chute lines. In tying the chutes to the bundle all four chute lines should be passed under the bundle ties and the chute suspended exactly over the middle of the bundle.

Use of Silk Cargo Chutes: Due to the small number of condemned Army and Navy parachutes available it is recommended that these parachutes be used only for dropping the more valuable supplies such as pumps, radios, large mess kits, etc.

Although the capacity of these chutes is greater, it is advisable to limit the load to 100 to 150 pounds, mainly to avoid trouble in handling the heavy weight in the plane.

These chutes will have a great deal more drift than the smaller burlap chutes, due to the much slower rate of descent (approximately 16 ft. per second). A good deal of care should be taken by the pickup crew to see that as little damage as possible is done to any part of the parachute. No straps, shroud lines or fabric should be cut. The whole canopy should be folded up immediately and tied up in the canvas bag which should be tied to the riser straps of every packed chute. In event there is no pickup bag the canopy should be put in a sack immediately. The chute should be sent back to the airport as soon as possible and should be well taken care of in the meantime.

Emphasis must be made to insure careful retrieving of the parachutes when they alight in trees. Pulling on the weight, canopy, or shroud lines will result only in tears in the silk panels. The tree should be climbed and the limbs cut away so that the chute will fall free to the ground.

Packing the Silk Cargo Chute: The following method or steps used to pack the silk cargo are described for conditions under which the parachutes will have to be packed at the supply base or airport.

A place should be picked out in which there is from 30 to 35 feet between two posts, trees, or comparable upright structures. Hooks, nails, or ropes should be placed at a height of 4 to 8 feet above the floor or ground.

- Step 1. Hook the apex of the parachute to one hook and tie the riser strap D-ring to the other hook by a short rope.
- Step 2. Shake out all duff or other material which may have been picked up in the folds of the silk canopy.
- Step 3. Straighten out the shroud lines. That is, see that there are no shroud lines twisted, overlapped, or tangled in any way. The shroud

- lines should hang parallel from the canopy skirt to the connector links. (See Figures 25 and 30.) This step is important.
- Step 4. Find the panel with the manufacturer's label on it. (See Figure 31.) Then take the adjacent shroud line which runs to the edge of the connector link. Work around the skirt of the canopy so that the next shroud line is on the connector link.
- Step 5. Gather the shroud lines at the canopy skirt in one hand after extending each panel so that it folds between the adjacent shroud lines (Figure 32). The last panel folds around the folds of all the other panels. (Figure 33)
- Step 6. Release the parachute at both ends, being careful to keep the parachute as clean as possible and being careful not to unfold the canopy panels.
- Step 7. Tie the apex of the parachute to the small loop in the bottom of the parachute bag with a piece of string of about 10 pound tensile strength. (Ordinary grocer's string.)
- Step 8. To keep the shroud lines from getting tangled, etc., place rubber bands at intervals of 18 to 20 inches by pulling a loop of all the shroud lines through the tripled rubber band. (This step can be done before Step 7.) Care must be taken to keep the shrouds from tangling.
- Step 9. Fold the canopy with folded panels into the parachute bag beginning at the apex (Figure 34). The fluffiness of the silk will necessitate stuffing the folds down into the bag, but as long as some semblance of folds is maintained the parachute will operate correctly.
- Step 10. Fold the pickup bag into a square (of about 3 4 inches) and tie (by the tie cord) to one riser strap near the connector link.
- Step 11. The shroud lines and riser straps are then coiled or folded on the top of the canopy in such a way as not to be able to tangle.
- Step 12. The top of the bag is then closed by placing the tongues with the grommets over the tongue with the fastener post and then placing the lift strap, which is attached to the connecting loop, in position and snapping the fastener (on the 4th tongue) in place on the post.
- Step 13. The riser strap should be inside of the bag with the D-ring sticking out between two of the tongues (see diagram). The connecting loop strap is snapped to the D-ring and left outside of the bag, but cannot be used as a handle. (Always pick the packed bag up by the D-ring on the bottom of the bag.)

An eight to twelve-foot static line of 3/16" or 1/4" rope should be

attached to the D-ring on the bottom of the bag with the other end tied to a solid cross member of the plane frame. This static line does not necessarily have to be attached to the bag until the load is ready to be discharged. In this way only one static line need be carried in the plane for several parachutes and the parachute bag would be easier to handle without the static line being tied to it.

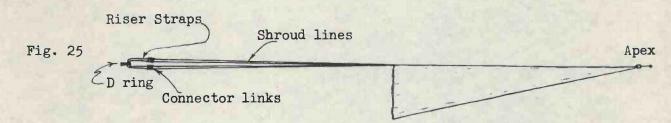
The static line and bag should be pulled back into the plane as soon as the parachute is jerked out of the bag, thereby preventing any damage to the fuselage caused by the slapping action of bag and rope.

Care and Storage of the Silk Chutes: The silk chutes should be hung up to air at least once every three months.

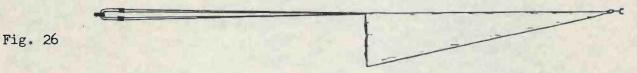
When the chutes come in from the field they should be hung up immediately. Before repacking they should be inspected and repaired where necessary.

The chutes must be stored in a clean dry place.

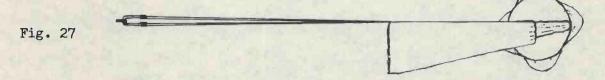
PACKING SILK CARGO CHUTES



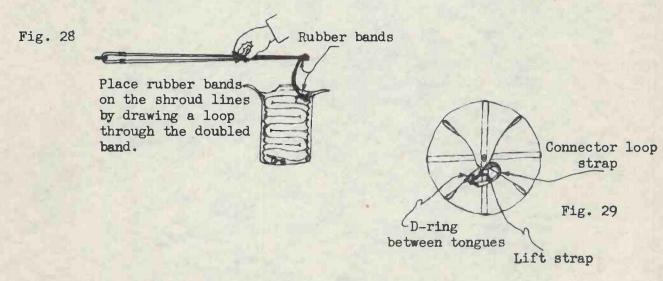
Stretch the parachute out, straighten shroud lines, and fold panels.



Release both ends and lay the parachute flat on clean floor or canvas. Tie the apex of the canopy to the loop in the bottom of the bag with a string.



Fold the canopy into the bag as shown in Figure 34.



R-6 F. C. Hdbk. Page added 5-23-41 No. 2

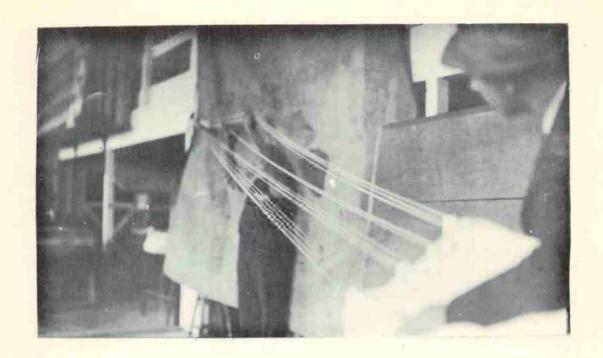


Figure 30: Shroud lines stretched and hanging parallel.

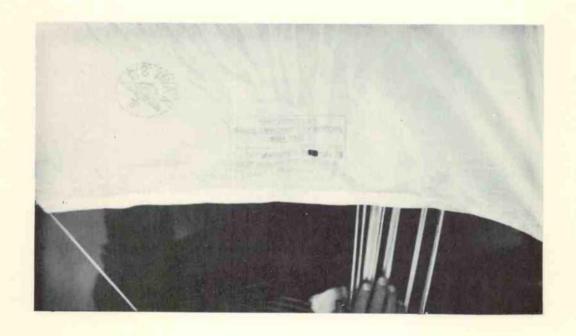


Figure 31: Manufacturer's label on canopy panel.

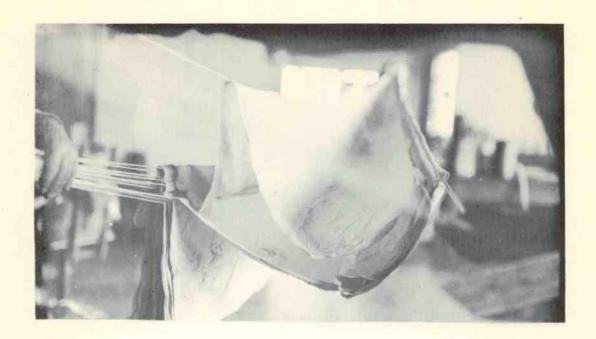


Figure 32: Folding each panel by extending the skirt of the canopy and then drawing the shroud lines together.

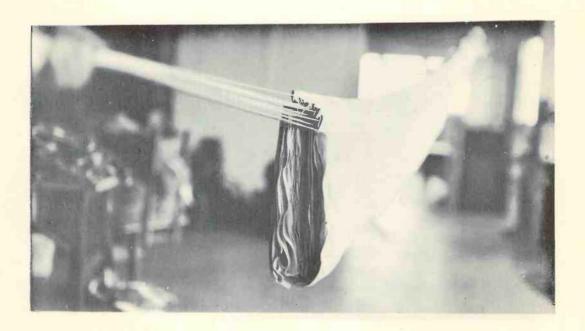


Figure 33: Shows the folds of each panel hanging down between the shroud lines and all enfolded within the last panel.

R-6 F. C. Hdbk. Page added 5-23-41 No. 2

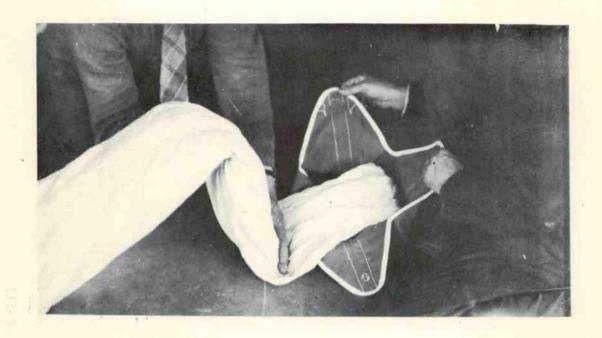


Figure 34: Starting the folds into the parachute bag after having tied the apex of the chute to the bottom of the bag.

R-6 F. C. Hdbk. Page added 5-23-41 No. 2

Checking

The checker should weigh each bundle complete with chute and packaging material. A tag (see Figure 35 for sample) should be attached to each bundle. He should then make up a summary of the information on the tags and list on the flight report. (See Figure 36 for sample flight report.) He should keep one copy, give one copy to the pilot, and attach a third copy to one of the bundles. This will enable the man in charge of the pickup crew to tell if all bundles dropped have been recovered or exactly which ones are missing and their contents. At the end of the project or when called for, the checker should turn over a completed flight report to the dispatcher for every flight made. The checker should accompany the load to the airport and should assist in loading the ship.

Sample Load Record (Tag for attaching to each bundle)

Figure 35

SAMPLE

AIRPLANE FLIGHT RECORD

Forest		7 1 2 2 1 <u>1 </u>	Date
	1 E E 1 E E 1 E	Fire	
Pilot			Dropper
Destination		Flight No	
Time Out	Time In	Flight Ti	me
Landing Field Page			

gat L. C. C. C.		Gross Weight	
Bundle No.	Contents	Weight	Damage
			× 1
			7 7 7 6 10 1
the second second			

Figure 36

Pilot Instructions

The pilot may be called upon to render service at all hours between daylight and dark, particularly just after daylight as conditions are then usually the best.

No flights should be made except on authority of the dispatcher.

The pilot as well as the dispatcher will keep a record of flying and standby time and turn it in each day. Taxiing is counted as flying time.

Flight control rules must be established when several planes are in use. This is particularly important when the area is blanketed with smoke.

Written instructions should be provided each pilot indicating the point or points at which supplies are to be dropped, as well as the numbers of each package to be delivered at the respective stations. (Flight record.)

Each pilot should be equipped with a map on which the following data is recorded:

- l. Physical hazards in and adjacent to the fire area, such as promon tories, sharply broken topography, abrupt changes in the elevation of the higher ridges, cliffs, and other obstructions, and the nearest possible forced landing chance.
- · 2. A flight course with alternate routes platted to keep planes in the clear when smoke closes in on the area. The course should be tied to easily recognized landmarks.

Departure times of the planes should be adjusted to the local require ments.

The pilot will determine the maximum load to be carried under the circumstances. Since in most instances it is desirable to load as heavily as possible, the pilot should not figure on carrying more gasoline than will allow an ample margin for the round trip.

Cargo storage in the plane should be guided by the order in which the packages are to be discharged.

Provisions should be made for a final inspection of each package loaded in the plane and a record made of the weights.

The pilot should not let an untrained, inexperienced man act as dropper. The pilot should insist that the dropper use a lineman's belt at all times. The dropper must be furnished a parachute by either the airplane operator or the Forest Service. Preferably it should be the quick detachable type.

As a safety measure, pilot and dropper should be required to wear goggles when baled hay or similar cargo is handled.

A final check should be made of fuel and oil before taking off.

Flight elevations should be established for both outgoing and incoming planes, so that all traffic will have a clear lane.

Standard left turns should be required on the field.

When several fires are being serviced, consideration must be given to the length of time required by each plane to reach the fire area, drop its load and return to the field.

Refueling operations should be adjusted to flight requirements.

The dropping should be done from as low an altitude as the pilot deems safe, considering the topography, so that the loads will not scatter more than necessary. Dropping is frequently done from 400 feet to 1,000 feet above the ground. If closer than 300 feet above the ground, some chutes may not have time to open.

After having decided upon the dropping altitude, the pilot should watch his altimeter and hold to this elevation while dropping the whole load as the bundles will then all have approximately the same drift and will land with more uniform accuracy.

The pilot should not dive at the target but should keep the plane on the same level while dropping supplies.

The plane should approach the target heading directly into the wind-as indicated by a smudge built by the men on the ground or other indications. Wind direction may also be obtained from lookouts in the vicinity, by radio or telephone before leaving the base.

In most cases the pilot is better able to determine when the package should be dropped than is the dropper and should give the signal to the dropper to let go.

There are several reasons and advantages of the pilot doing the aiming. The pilot approaches the target in a straight line of flight and can see the target under the ship as well as the dropper. He may tip the plane momentarily to get a better view. While making the circle the pilot can keep his eye on the target while the dropper is busy getting the next load prepared.

As the plane approaches the target the pilot will say to the dropper: "Coming in." This is to inform the dropper that they are approaching the target.

As they near the target, the pilot says, "Get set." The dropper then prepares himself to release the bundle.

When the pilot gives the word "Go," the dropper instantly releases the package.

The plane should then turn to enable the pilot to see where the load lands.

The pilot then makes a complete circle and again approaches the target, heading directly into the wind with such corrections as may have been made after it was seen where the bundle fell.

Some pilots expedite discharge of load by making a continuous rather steep banked turn while discharging the entire load.

The pilot should try to cut down the size of his circles so that no more flying time than necessary will be spent in discharging loads.

The first load should be discharged when directly over the target. It may drift considerably before it lands, and the pilot should watch carefully where it lands. He should keep an eye on it until it actually lands or disappears among the trees; otherwise the place of landing may be considerably misjudged.

Next time the target is approached, the load should be discharged over a point which is as far from the target as the landing spot of the first load on the opposite side. The second load should then drift approximately as much as the first load did and land near the target.

If the first load landed to one side as well as back of the target, the ship was not in line on the first trip, and the pilot should change his approach correspondingly so that he will approach the target more nearly from the direction in which the first load landed.

Dropper Instructions

The dropper should have the pilot show him how to use the regular life-saving parachute and adjust the straps. He should lay the chute aside in the cabin within easy reach. The best chutes are the quick detachable type, which allows wearing the harness and quick attachment of the pack in emergency.

See that all chairs are removed from the cabin. A plywood board should be fastened to the floor of the cabin at the door in order to facilitate discharging the bundles. The door should be removed. Where a trip box is used, (see Figure 24) this box should be fastened to the plywood floorboard with strap hinges.

The dropper should be furnished with a pair of wide angle goggles and a helmet. An inexpensive but satisfactory pair of goggles is the "Sees-all" which can be ordered from Air Associates, Glendale, California, price \$7.85 a pair. A leather helmet costs \$3.50.

A lineman's belt and strap, secured forward to a member of the fuselage, should always be used as a safety measure while dropping.

Loading: The dropper should check over the bundles and see to it that no tags are omitted.

The dropper should assist with loading the plane and see to it that bundles are properly tied and the ropes taut so that they will hang in the proper position when suspended, and that they are tied to the chute very substantially. All the ends of the chute lines should be passed under as many ropes on the bundle as possible. If a medium-weight or heavy bundle is secured to only one rope of the bundle, the load is sure to tear loose when the chute opens. He should check up on the rubber bands, being sure that they can be easily removed from the chute roll.

Also check on the chutes being rolled up to proper size. The roll for single chutes should be cylindrical and about 18" long by 22" around (in circumference). Any chutes that may have been squashed out of shape should be shaped up just before discharging.

If there are any saws to discharge, place them in the ship first, on the floor and on the same side as the door, with the hose guard toward the side of the cabin.

Check on loads requiring pads.

Return all bundles not properly packed or tied. Do not accept items such as cantaloupes, fresh tomatoes, or supplies packed in glass jars.

Discharging

1. Discharging by hand:

This method of discharge has been largely replaced by the more convenient method of using a trip box for discharging bundles and chutes.

It will still have to be used when saws are discharged, and it may be necessary to use while making a trip or two until a suitable trip box can be constructed.

In discharging by hand hold both the load and the chute with one hand and <u>push</u> rather than throw the load out and down. The foot may be used to assist the push on heavy bundles. The chute is held by a few fingers under some of the strands of chute lines with the back of the hand against the chute roll. With bulky bundles, leave a few feet of slack between the chute and the load. The chute will then more readily pull away from the load.

Saws are discharged differently from other packages. Hold the saws between yourself and the door with the board against the rear corner of the door opening, the hose guard toward the front, and the air striking the top of the saws at a slight angle. Stick the board out a foot or two and give a quick shove downward when discharging.



Figure 24

Hinged trip box. Boards marked 1 and 2 should be omitted.

R-6 F. C. Hdbk.
Page added 5-23-41
No. 2

It is easier to discharge several saws than just one or two, due to the added weight. This bundle acts as a wing and must be pushed out and down in order to safely clear the tail of the plane.

Be sure not to let a chute go until the load is also ready to go or the chute may foul the tail surfaces.

2. Discharging with Trip Box: (See Figure 24)

The best method of discharge is to use a 1/2" plywood board hinged at the door opening on which one or more bundles and chutes are placed for discharge. A rope attached to the rear end of this board permits tripping. The board should be about as wide as the door, and there should be a side board about 6" high fastened to the side next to rear of cabin to prevent load or chute catching. The end of the board should project about 4" beyond the fuse-lage. The rear end should leave enough room for the foot of the dropper between the board and the side of the cabin to permit standing in a convenient position with one foot behind the box.

The bottom of the board is hinged to plywood covering the floor at the door. This board in turn is fastened down with the bolts, which ordinarily would hold the chairs in position.

Load and chutes are placed in the box. If several chutes are used, do not pile them on top of each other but place them on the side and back of the load so that each roll is separate. Watch the load and the chutes so they do not accidentally work out.

<u>Caution</u>: Be sure to <u>remove</u> rubber band around each chute. Do not let it remain around the chute lines, as it may slide up on the lines and pinch the chute.

Pick-Up Crew Instructions

Selecting the Landing Location: The following points should be considered in determining the best location available for dropping supplies:

- 1. It is desirable to have the landing location higher than the surrounding terrain.
- 2. The topography should be such that planes can make not over a one-mile radius turn at 1,000 feet above the target.
- 3. Openings, areas of small or scattered timber, or brush patches are best for target locations. Bundles often hang up in tall trees and in dense cover they are difficult to find and retrieve. The more level the landing location, the less the damage to supplies and the easier for the ground crew to retrieve.

- 4. Hard, bare, or rocky ground causes more damage to bundles than grass, brush, or timber-covered areas.
- 5. From the safety angle it is best to locate dropping grounds away from fire camps or other concentrations of men unless this involves considerable extra packing.

Marking the Landing Location: Targets of cloth (yellow or orange is best) should be in the form of a cross, each bar approximately 3' x 30'. Mirror flashes, smudges, or a radioed description of the landing location often serves well. However, ground crews usually take too much for granted in assuming that a small target can be spotted from the air.

Retrieving Bundles: A number of methods of locating and marking the location of fallen bundles have been successfully used. Cover and topography conditions and number of men available may decide the best method to use.

Two common methods are as follows:

- l. A man stands on a high point near the target and takes compass bearings and approximate distances on bundles as they fall. After the plane has left, one or more men can retrieve the bundles by checking compass readings and distance.
- 2. A small group of men (usually 4-6) stands near the target. When a bundle falls a man starts for it immediately. By the time he gets back he will be in line to retrieve another bundle.

Unnecessary shouting should be avoided in order that a warning shout will be heeded by anyone not aware that a bundle is falling near him.

If the pick-up crew is experiencing difficulty in locating bundles, they should request the packers to attach a yellow cloth streamer (3" x 20' is a good size) to each bundle.

Care of Chutes and Bundles: The pick-up crew should be instructed to bring in the loads in the same condition as found. The chutes should not be taken loose from the bundles or the lines from the chutes. The man in charge should list any damage done to bundles and cause on his copy of the flight report.

Chutes complete with lines should be promptly returned to the supply base. This is important.

Cooks should be instructed to use all damaged cans first to reduce spoilage to an absolute minimum.

General Safety Rules for Dropping Supplies

The Forest Service provides the following rules as precautionary measures to eliminate as far as possible needless risk by Government and airplane operator personnel in connection with dropping supplies.

Preflight Precautions

Much can be accomplished prior to the take-off which will decrease or eliminate hazards during dropping flights. Careful attention must be given to the following:

- 1. All persons connected with dropping operations, including ground personnel, must be familiar with regional instructions for dropping supplies.
 - 2. Check of airplane fuel and oil supply by pilot before each flight.
- 3. Have available flight and Forest Service map showing distance, route to and from a dropping point or target. Alternate emergency landing fields or areas should be plotted on flight map in case bad flying weather, motor trouble, or other difficulties require a forced landing.
- 4. Check of supplies to ascertain that they are properly packed, lashed, rigged, and tied to cargo parachute. Each parachute should be rerolled and its component parts inspected the day it is to be dropped.
- 5. Make certain prior to loading that it is physically possible for the dropper to discharge each bundle and its respective parachute. Lifting awkward and heavy supplies into a plane is much easier and less dangerous than discharging them during flight.
- 6. The operator or Forest Service dropper should be experienced in discharging cargo during flight at a pilot's signal by hand, voice, or other method. Inexperienced droppers should have one or more practice dropping flights at the airport prior to dropping supplies at fires.
- 7. The dropper should wear a safety belt to which a 3/8" manila rope is fastened and anchored to some structural airplane member or fitting. This is necessary to prevent the possibility of an inadvertent slip and fall from the airplane during dropping operations. The dropper should wear suitable foot gear to prevent slipping during flight, preferably shoes with soft soles such as crepe rubber. Hobnailed shoes must not be worn. He should also wear clothing of a type which will not catch or snag easily on any airplane fitting. He should be furnished with an airman's helmet and goggles. When the cabin door is removed a detachable safety bar of aircraft tubing should be provided by the operator to fit across the cabin door opening. This serves as a hand hold and guard rail. It should, if necessary, be removable during flight to permit easy exit of bulky material such as baled hay, crated saws, and longhandled tools.
- 8. The pilot and dropper should supervise the stowing of supplies within the cabin to make certain that the load is properly distributed for take-off and arranged for easy handling by the dropper.
- 9. All cargo carried by the plane should be weighed prior to loading and the pilot's approval obtained. This is necessary in order to prevent overloading the plane beyond its gross load capacity.

- 10. A windsock or suitable substitute should be provided at the landing field to indicate wind direction for take-off and for landing.
- ll. If convenient and practical, supplies should be dropped during the period of day when gusty surface wind and air bumps are at a minimum. These periods usually occur during the early forenoon or late afternoon.
- 12. The pilot and dropper shall wear or have available approved parachutes while in flight. If available, the dropper should wear a quick detachable harness and have the parachute in readiness at the time supplies are being dropped.

Precautions in Locating Landing Target

- 1. Select, if possible, an open site adjacent to the fire camp having the best available approach and exit for the airplane. A heavily loaded airplane making turns in violent up and down drafts requires at least a mile of horizontal space in which to climb and turn back for repeated chute drops.
- 2. Down drafts are particularly dangerous near hot burning fires so such places must be avoided by airplanes.

Precautions when Dropping Supplies

l. Pilot's responsibility: The pilot is responsible for the safety of the flight. His judgment is final in determining whether or not supplies can be dropped at a given point under given conditions. It is his responsibility to turn back if he finds that the weather or terrain considerations are too dangerous.

It is the responsibility of the airplane pilot to conform with civil air regulations and the Forest Service Certificate of Non-Application of Air Traffic Rules. The latter permits certain exceptions to contractor pilots flying for the Forest Service during operations. Forest officers can inform pilots as to exceptions if requested.

- 2. The pilot, after locating the dropping point or target, decides upon the best location for approach to and return from the target for successive drops. The direction of the wind, proximity of terrain obstacles, bumpiness of the air, and lowest safe altitude indicate in each case the best and safest approach for dropping. If possible, an upwind approach should always be made. Downwind approaches must be avoided. The pilot should make one or more practice approaches at a safe altitude to feel out the up and down drafts and so determine the lowest safe altitude at which parachute supplies can be released over a given target. The best altitude for dropping supplies over targets will vary according to the conditions stated above. For best accuracy the altitude over the target should be less than 1,000 feet.
- 4. During the approach and while circling for an approach, the dropper places the parachute and its cargo in a position of readiness for exit. At this time he also makes an inspection of the packaging, lashing, knots,

and parachute roll to be certain that all will function as desired. In using Region 6 burlap parachutes the rubber band encircling the rolled parachute must be removed prior to dropping, otherwise it will fail to open. Particular attention should be given to the possibility of the parachute and its attached cargo fouling on the door casing, fitting, or hinges when it is dropped. The dropper must make certain that the load and the parachute are dropped from the airplane in such a way that the parachute will not open before the load is dropped and foul on the tail surfaces of the airplane. The entire unit must fall downwards away from the door jamb, clearing the ship before the parachute begins to unroll and open. Ten or more feet of fall is a sufficient safety margin for the parachute to begin to open. A sharp hunting knife should be instantly available for any emergency should the dropper have to cut ropes, parachute, or packaging which, through unforeseen circumstances, might foul before clearing the door exit or tail surfaces.

- 4. It will usually require from two to three minutes for the pilot to make each approach to drop. This is sufficient time for the dropper to prepare to drop and complete his inspection. If not ready, he should so signal the pilot, who will make another approach.
- 5. It should be understood by the pilot and dropper that no inflexible rules can be made to govern every situation. It must be realized that careful ground preparations, loading and stowing supplies, and their inspection, coupled with good flying judgment, are necessary at all times.
- 6. Particular care must be taken and good judgment exercised when low ceiling, poor visibility, and an awkward target location exist. It is the responsibility of the pilot to determine whether or not a safe flight can be made to conduct dropping operations.

FIRE CONTROL HANDBOOK

Region 6

PART III

SUPPRESSION

Chapter 6

AIRPLANE USE

PART III - SUPPRESSION - Chapter 6

AIRPLANE USE

Table of Contents		
	Page	
General Instructions in Region 6	III-6-1 III-6-1	
Handling Aviation Gasoline at Airports and Notes on Fueling Aircraft Basic Precautions Receiving and Storing Gasoline at Airports Tank Trucks and Storage Tanks Drums Filling Airplane Tanks General Precautions From Underground Tanks by Hose From Drums With Hand Pump By Bucket or Can	III-6-3 III-6-3 III-6-3 III-6-4 III-6-4 III-6-5 III-6-5 III-6-5	
Engine Starting and Warm-up	III-6-6	
Airports	III-6-7	
Hangar	III-6-8	
Fuels and Oils	III-6-9	
Miscellaneous	III <mark>-6</mark> -9	
R-6 Inspection Outline - Airplanes, Pilots, Airports. Reports and Records Airplane Pilots Airports Hangar Fuel and Oil	III-6-13 III-6-13 III-6-13 III-6-12 III-6-12	

III-6-13

AIRPLANE USE

General Instructions in Region 6

The purpose of these instructions is to outline a general policy for airplane operation and maintenance. It is intended to cover all the more important items connected with safe airplane operation. Definite instructions are given regarding the grades of gasoline and oil required by the various types of motors now being used in Region 6 airplanes.

Experiences during the past three years, during which the Forest Service operated its own airplanes, is evidence that there is need for more specific instructions. A number of pilots and other personnel connected with airplane operations have changed each year.

It is recognized that to prescribe rules or to outline methods to fit all the varying conditions encountered is not possible. Points covered and instructions given are confined to the more obvious and major items. They are based on methods and principles which have been tried and proved their worth.

Airplane Maintenance and Care

Maintenance is the term applied to the processes necessary for retention of the airplane structure, power plant, equipment, and accessories in satisfactory condition for flight. The airplane is a highly stressed structure, designed with a load factor dependent on the work it is called upon to perform. The airplane engine, with its low weight per horsepower, is dependent on rigid inspection and maintenance to insure efficient and dependable operation.

Although the pilot may not be an experienced mechanic, he is responsible for maintaining his airplane in proper condition.

For their assistance and guidance, L-5 pilots will be supplied with U. S. Army Air Force Aircraft Inspection and Maintenance Guide, 00-20A-2-L-5. Noorduyn pilots will be supplied with Guide 00-20A-2-C-64A. Pilots will not be expected and should not attempt to do maintenance work which they do not feel entirely competent to do.

Airplanes must be properly parked to prevent damage from wind. A sudden gust of wind could cause serious damage and render an airplane unairworthy when it would be urgently needed for fire control use.

The pilot will see that the controls are secured when the airplane is left unattended. He will chock all wheels, front and rear, and secure the airplane to a safe mooring when it is left out of a hangar at night or during the day if there is any indication of a thunderstorm.

Airplanes parked on the Illinois Valley Airport will be headed west or south and those parked on the Intercity Airport will be headed west or north. Pilots are cautioned not to leave an L-5 in such a position that a strong wind might blow on it from the tail, as serious damage to the flaps and control surfaces may result. Flaps should be lowered on the L-5s when parked unattended.

R-6 F. C. Hdbk. Issued 6-18-48 No. 45 Airplanes must not be parked where a careless driver may damage them with a car or truck.

Conditions on some airports make it almost impossible to keep an airplane stationed there free from dust; however, it is expected that they will be reasonably clean and free from oil on the fabric. Motor compartments will be kept free of excessive oil accumulation.

L-5 gasoline tanks and Noorduyn wing tanks should be filled upon landing to insure that they will be ready for a flight without delay. At times when heavy loads are carried for short distances with the Noorduyns, the pilot may wish to fly with less gasoline and down to the minimum authorized when a fairly definite length of time for the flight is known in advance. Airplanes will always have more than the minimum amount of oil in their motor or oil tank.

Since R-6 Forest Service airports are not surfaced, it is important that tires are properly inflated. Tires must be inspected for cuts and bruises.

Propellers are likely to be damaged by rocks during the season. Any serious damage should be reported on Form R6-F23. Counter-weight bearings must be greased with Lubriplate grease at least every ten hours of operation.

Gasoline gauges should be kept clean and their accuracy checked occasionally when filling the gasoline tanks. Wing tank gauges on the Noorduyns require special attention to be easily read at all times.

Small holes and tears in the covering are not serious, but should be repaired as soon as operations will permit.

Care must be exercised in cleaning windshields. A special preparation for cleaning plexiglass is supplied when airplanes leave the Airbase Shop.

The cabin of the airplane should be clean at all times. A "No Smoking" sign must be posted where it is visible to passengers.

Hold-down studs for the seats must be removed when seats are not in the airplane. These are of a special type and must not be lost.

Normally when the plane is used to transport passengers from one airport to another, regular plane seats with seat belts will be placed in the plane. Passengers will fasten seat belts when taking off or landing or when air is turbulent.

When the airplanes leave Portland, first-aid kits are complete and fire extinguishers are full. If it should become necessary to use some of this material, it must be replaced without delay.

The baggage compartment contains emergency motor tools, a hand axe and 2 days' emergency rations. It is intended that these be there at all times.

R-6 F. C. Hdbk. Issued 6-18-48 No. 45 A minimum of 4 message droppers will be carried in airplanes accessible to the pilot, observer or cargo dropper.

Parachutes placed in airplanes intended for use, should necessity arise, must meet CAA requirements as to condition and packing dates.

Handling Aviation Gasoline At Airports and Notes on Fueling Aircraft

Basic Precautions

Electrically operated servicing facilities have been installed on two of the Region 6 airports, but since all flying is not done from these fields, other methods of fueling airplanes are mentioned in the following:

No Smoking: Prohibit smoking and other sources of ignition where gasoline is stored or handled.

Prevent Gasoline Spills: If gasoline is spilled on an airplane, it must be entirely removed before the engine is started. The airplane must also be moved from where any gasoline is spilled on the ground before starting the engine.

Prevent Static Sparks: All gasoline hose must be metal lined with an adequate bonding cable securely attached to the nozzle. Before gasoline is transferred to airplane tank, the clip on the bonding cable must be attached to some uninsulated and unpainted metal part of the airplane in continuous metallic contact with the tank but not adjacent to tank filling opening. Make the connection before fill cap is removed from the opening and do not break it until after the nozzle or funnel has been removed and cap of the tank has been replaced.

The same precautions must be observed whenever gasoline is transferred from one container to another. Bonding is absolutely necessary to equalize static electrical charges and to prevent static sparks. Bonding equipment should be periodically inspected.

<u>Filter All Gasoline</u>: All gasoline must be filtered as it enters airplane tank. In spite of precautions, dirt, dust or water will occasionally get into gasoline at airports. This must be removed by careful filtering of gasoline as it enters the airplane tank.

Receiving and Storing Gasoline At Airports

Tank Trucks and Storage Tanks

Check for Water in Gasoline: Tank trucks and storage tanks must be checked for water every time a delivery is made (oftener if deliveries are infrequent) to insure absence of water in gasoline.

Prevent Static Sparks: Electrical connection between nozzle of the tank truck unloading hose and storage tank shall be established before storage tank is opened. This may be accomplished by a wire attached to the nozzle and clipped to a connection on the tank.

R-6 F. C. Hdbk. Issued 6-18-48 No. 45 Stop Truck Engine: Truck engine must be stopped before unloading operations begin.

Replace Fill Cap: All fill caps must be properly replaced and locked to prevent entrance of water or dirt into tank.

Drums

Handle Drums Gently: Drums must never be dropped from trucks even on soft ground, as the impact may loosen scale or galvanizing.

Use Skids: Drums must be unloaded by sliding down skids, end first. They must not be rolled down. They must not be bumped together.

Store Drums On End: Full drums must be stored plug up, on boards or timbers, preferably under cover to protect them from sun and rain. If necessary to store in the open, always stand drums on end, blocking up one side so as to allow only a minimum amount of water to stand on drum head. Be sure the low spot in the tilted head is away from both plugs; otherwise water may seep in through leaky threads.

Emptying Drums Into Storage Tank: To empty drums into an underground tank, use a platform and skid, the platform to be high enough to be above the funnel in fill pipe. Spot drum on the platform over funnel and connect bonding clips. Remove small vent plug and discharge gasoline into funnel. Be sure funnel is large enough to prevent spillage. If drums have been exposed to heat of sun, great care must be taken in removal of plugs to relieve pressure gradually. If possible, heated drums should be cooled with water before plugs are removed.

Filling Airplane Tanks

General Precautions

Fill Tanks Out of Doors: Tank filling operations must not be carried on inside hangar.

Prevent Static Sparks: Bonding must be complete before and during filling operations, and not be broken until after the nozzle or funnel has been removed and cap of the tank has been replaced.

Fire Extinguishers: During tank filling operations, an Underwriters' approved fire extinguisher must be within immediate reach of the fueler, or in hands of another competent attendant.

Filter Gasoline: Gasoline must be filtered as it is being put into airplane tanks. For this purpose a 200-mesh metal screen should be used. Metal screens must be free from corrosion and any filter used must be free from holes. (The use of chamois skin as a gasoline filter is dangerous because of the generation of static electricity from the friction of the fluid passing through the chamois skin. Chamois is a non-conductor and cannot be grounded satisfactorily.)

Use Filter Carefully: The stream of gasoline must be directed against the side of filter funnel and not directly on filter medium as pressure may force water through into tank. Gasoline on filter must be watched constantly. If sediment or water is observed, filling must be discontinued until its source is located and trouble eliminated.

From Underground Tanks by Hose

Check For Water In Gasoline: Take constant precaution against water getting into gasoline delivered to airplanes. This means frequent checking of underground tanks to be sure they are in good order. The presence of water can be determined by testing with water testing paper or paint soluble in water.

Keep Fueling Pits Clean And In Good Repair: Do not allow water or gasoline to collect in pits. See that all fixtures and fittings are vapor proof and properly maintained.

Handle Gasoline Hose Carefully: Take good care of the fueling hose. Take it from the pit carefully. Carry the hose to the airplane; do not drag it. Prevent kinks and short loops in the hose. Never let nozzle touch the ground. Use the minimum length of hose practical under prevailing conditions.

<u>Clean Sediment Traps</u>: If the gasoline system has sediment traps, see that they are flushed frequently.

From Drums With Hand Pump (Emergency method only.)

Prevent Friction Sparks: Hand pumps for pumping gasoline from drums should have a sufficient number of brass parts to prevent steel on steel blows against the drum which might cause a spark. A bronze rather than cast iron bushing to hold pump in place is recommended. In using wrenches to remove plugs, insert pump, etc., extreme care must be exercised to prevent a slip which might result in a spark-producing blow.

Depth Of Pump Inlet: The inlet to the pump should be not less than 4 inches above the bottom of the drum to guard against withdrawal of water or sediment.

By Bucket Or Can (Emergency method only.)

Use Only When Absolutely Necessary: In the case of forced landings and similar emergency situations where it becomes necessary to fuel an airplane by bucket, extra care and ingenuity must be exercised in order to avoid further trouble.

Use Only Clean, Dry Bucket Or Can: Be sure the bucket used is clean and free of water. If possible, use a bucket with spout and lid so that top can be closed during fueling.

Use Large Funnel: Use as large a funnel as is available.

Prevent Static Sparks: In refueling airplane tanks from cans, the can must be maintained in contact with the filler neck or funnel to avoid static sparks.

Filter The Gasoline: Be sure to filter gasoline as it goes into airplane. Use the best filter available, such as a 200-mesh metal screen.

gasoline. Prevent Gasoline Spills: Be especially careful not to spill

Engine Starting and Warm-up

All Forest Service airplanes are equipped with electric starters. When a radial engine has not been run previously, on any day, it must be pulled through at least two full revolutions by hand before engaging the electric starter. Should electric starter fail or battery charge get too low for starting, no inexperienced person should be permitted to attempt to start the engine by turning the propeller. At no time will an airplane engine be started without a competent and experienced pilot or mechanic at the controls.

Engines must be given a warm-up at the R.P.M. recommended by its manufacturer. Serious damage can result to an engine from flying without properly warming up the engine before take-off at the R.P.M. recommended.

Since our airports are not hard-surfaced, care should be exercised in taxiing to prevent dusting everybody and everything at the parking area. The amount of dust blown in the hangar and on cars or equipment on the airport can be materially reduced by intelligent use of the throttle.

Safe practice recommends that take-off will begin at the end of runway being used. Manifold pressures must be kept within the limits specified by the manufacturer. R.P.M. will be reduced at the proper time, depending on conditions prevailing.

Proper use of engine controls will result in the most reliable and trouble-free service. Since much of our flying is done above 5,000 feet, the mixture control can be used to good advantage for best performance. Care must be exercised so that head temperatures are not raised above limits.

Noorduyns are used chiefly for cargo dropping and for transporting smokejumpers; whereas, the smaller planes drop cargo only occasionally. It is not necessary to lower the flaps when cargo is discharged and neither is it necessary to put the airplane in a stalled attitude. At the time cargo is discharged, the throttle should be retarded to a point where the propeller slipstream will not exceed speed of the airplane. Speed should be reduced to a comfortable margin above stalling speed, depending on amount of turbulence. After cargo is discharged or jumpers are out, the throttle is gently returned to its normal position, avoiding any rapid acceleration of the motor.

Efficient operation in returning to the airport will have the airplane at about 1,000 feet altitude when it is reached, avoiding long glides and unnecessary maneuvering.

R-6 F. C. Hdbk.

Issued 6-18-48 No. 45 Pilots are expected to know their airplane and use or not use flaps as good piloting practice would dictate.

The amount of gasoline that will be carried will vary as to length of flights to be flown. A one-hour reserve for all flights with Noorduyns and forty-five minutes for the L-5 is desired.

The oil level in L-5s and Stinson will be kept up to recommended level as determined by the oil gauge. Oil level in Noorduyns should always indicate in excess of 10 gallons; however, the level need not be kept to full capacity.

To insure that airplanes will be in condition when they are needed, a minimum of one-half hour should be flown by each plane each week. This will give the pilot a minimum of experience and an opportunity to test the functioning of his airplane and its equipment. The mere fact that an aircraft functioned during a flight in no way guarantees its acceptability for further flight. Operating inspections serve as a safeguard against the influences of deterioration. By inspection alone are incipient failures discovered and any oversights of maintenance located.

Airports

Condition of the surface of an airport is important not only to insure safe operation, but to minimize wear and damage to the airplane.

Loose rocks will be thrown onto tail surfaces and cause tears and bruises in the fabric. Larger sharp rocks will damage tires. Weeds will damage propellers and retard acceleration. Certain types of weeds will hold blowing dust and sand and cause humps and a rough field. These hazards should be removed.

Gopher hills and holes can ruin an otherwise good airstrip. Airplanes cannot be safely operated from a field covered with pocket gopher hills. If this trouble is taken care of early, a minimum amount of work will be required.

Approach obstructions should be removed wherever possible. Hard to see obstructions should be painted, in certain instances, such as a fence at the end of a runway or telephone poles.

A windsock must be mounted on a pole on each airport. It must be located where it is out of any reasonable possible line of flight and where it will give a true indication of wind direction and velocity. The sock must be of a bright color in contrast to surrounding vegetation. The pole must be painted with alternate bands of white and orange, terminating with an orange band at the top. Width of bands shall be one-fifth of height of the pole. Posts at end of landing area fencing should be painted orange for better visibility.

The airplane parking area should be free from holes or rocks which would be a hazard when parking. It should be so located that dust raised when planes are taxied out or when they are parked will cause a minimum of trouble.

F. C. Hdbk. Issued 6-18-48 No. 45 Tie-down anchors will be provided for each plane. Four anchors will be provided for each Noorduyn and three for the L-5s or Stinson. The attaching place must be such that no damage will result if an airplane is taxied over it. A piece of wood of ample size, buried lengthwise with a length of stranded wire cable around, which reaches just above the ground, when a satisfactory anchor. Stakes are not satisfactory for permanent tie-downs.

Car parking areas should be provided and so arranged that cars will not drive around or near the airplanes. A careless driver may damage an airplane, and, if the area is too close to airplane parking area, it will be an additional hazard for the pilot. Proper location will reduce the amount of dust blown on cars by planes when they are being moved.

To reduce damage to propellers, a hard-surfaced run-up block should be provided. This should not be at ends of the runway, but in that proximity if possible. A surfaced area where airplanes can be taxied on for servicing and inspections is of prime importance and can serve both purposes if properly located.

An extension bell should be provided for the telephone to insure all calls being promptly answered at the airport.

Hangar

Where hangars are provided, good housekeeping should be practiced. A place should be provided for all equipment kept in them.

A dust-proof cabinet should be provided for oil containers, clean wiping rags, funnels, windshield cleaner, tools, etc.

Oil containers and funnels must be kept free from dust by covering with a cloth when not in use.

Gasoline strainers must be protected from dust and kept clean at all times.

A commercial type six-foot stepladder is a necessity to properly service our airplanes. Using boxes or barrels or a cumbersome type of ladder slows down the work and is not conducive to safe working conditions.

Containers should be provided for clean wiping cloths and also one for oily rags and debris.

A "No Smoking" sign should be posted and observed.

Fuels and Oils

The grade of gasoline varies with different engines. Noorduyns require 91-octane aviation gasoline. No other grade will be used. L-5s should use 80-octane lead-free gasoline. Where both grades are stored on an airport, care must be exercised that they do not get mixed either when the planes are fueled or when gasoline is put into underground tanks. Since gasoline deteriorates when kept over long periods, the amount of carry-over from one season to the next must be kept to a minimum.

R-6 F. C. Hdbk. Issued 6-18-48

No. 45

We are required to purchase airplane oils according to in the General Administration Handbook when purchased in quantity 1120 grade will be used in Noorduyns. The 1100 grade will be used in the Stinson. Deturgent oil will:

The dispensing equipment will be kept clean at all times. On funnels will be washed after using, if necessary, to insure that no foreign matter will contaminate the oil.

Miscellaneous

To complete the list of necessary equipment, a sufficient number of wheel chocks with ropes attached will be on hand. A 20" length of 4"x6" with two adjacent corners on a 6" side, trimmed down one inch, will make a satisfactory chock. Tie-down ropes of ample strength and length are recessary. A CO₂, fifteen-pound fire extinguisher, recently checked, will be on hand. Airplane grounding cables are necessary when refueling planes. These are flexible wires of sufficient length with a clip attached to each end for making electrical connections between airplanes and ground and the airplanes and barrels when fueling.

A place must be provided for storing the drop-port cover and passenger or jumper seat when not in use to prevent damage and be ready for use should a need arise.

Since a number of forms are required to maintain records on the airplanes, a place where the record can be kept and the information written in is necessary.

Form R6-F17, Flight Plan, is provided to make sure some responsible party will check in all flights made with airplanes owned or chartered by the Forest Service. It will be used for every flight except (1) when a CAA flight plan is filed, or (2) on days when the weather is clear, several flights of short duration are made over an established route to a fire camp to deliver supplies and the airport attendant remains at the airport until all planes have been accounted for.

Form 100-R6, Daily Aircraft Flight Report, is used to furnish necessary information for billing and other purposes.

Flight reports will be numbered consecutively, beginning with one (1) and continuing throughout the season. Each pilot will be given a letter which should precede the report number on each report he turns in. Take-off and landing time will be given as it appears on a 24-hour clock. Flight time begins at take-off and ends at the ramp or hangar. It will be recorded to the nearest five minutes.

Form R6-F23, Airplane Operation Report, is required to keep the Airbase Shop properly informed of the condition of all Region 6 airplanes at all times. The more complete the information, the more value the form will have for the purpose intended. All gasoline and oil put into airplanes must be accurately entered. The pre-flight check must be initialed before any flights are made.

Airplane and Engine Log Books will be kept current by the pilots.

R-6 F. C. Hdbk. Issued 6-18-48 No. 45

ots should become familiar with Forest Service maps. They should accurately locate any point in the area they are assigned to. If CAA Sectional Aeronautical Charts should be on hand for use flight be required to any place in Region 6.

It is desirable to have all pilots become familiar with all airports and landing fields in their respective areas. This will enable them to better judge maximum loads they may care to land with or take off with from the different fields, should it be desirable to use them at any time.